COMPARE AND CLINICALLY EVALUATE BILAMINAR TECHNIQUE USING CONNECTIVE TISSUE GRAFT AND PLATELET RICH FIBRIN IN THE MANAGEMENT OF MULTIPLE MILLER'S CLASS I GINGIVAL RECESSION - A 6 MONTHS COMPARATIVE STUDY

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THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

In partial fulfillment for the Degree of

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BRANCH II

PERIODONTICS

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CERTIFICATE

This is to certify that this dissertation titled **"COMPARE AND CLINICALLY EVALUATE BILAMINAR TECHNIQUE USING CONNECTIVE TISSUE GRAFT AND PLATELET RICH FIBRIN IN THE MANAGEMENT OF MULTIPLE MILLER'S CLASS I GINGIVAL RECESSION - A 6 MONTHS COMPARATIVE STUDY"** is a bonafide record of work done by **Dr.S.MOHANRAJ** under our guidance and to our satisfaction during his postgraduate study period from 2009-2012.

This dissertation is submitted to **THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY,** in partial fulfillment for the degree of **MASTER OF DENTAL SURGERY-PERIODONTOLOGY, BRANCH II.** It has not been submitted (partial or full) for the award of any other degree or diploma.

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LIST OF ABBREVIATIONS

AAP-	American academy of periodontics
ADM-	Alloderm
bFGF-	Basic fibroblast growth factor
CTG-	Connective tissue graft
CAL-	Clinical attachment level
CEJ-	Cemento enamel junction
DAT-	Direct attachment to tooth
ECM-	Extra cellular matrix
EGF-	Epidermal growth factor
GT-	Gingival thickness
GTR-	Guided tissue regeneration
PRF-	Platelet rich fibrin
PDGF-	Platelet Derived Growth Factor
PRP-	Platelet Rich Plasma
PD-	Probing depth
rCAL-	Relative clinical attachment level
RC-	Root coverage
RD-	Recession depth
SD-	Standard Deviation
TGF-	Transforming growth factor
VEGF-	Vascular Endothelial Growth factor
WKT-	Width of keratinized tissue

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ABSTRACT

Background:

Many surgical techniques have been proposed for the correction of root exposure. Among these the Connective Tissue Graft (CTG) techniques has been reported as offering the best results in terms of Root coverage (RC). However CTG require a second surgical site to harvest the graft, resulting in discomfort for the patient. The use of platelet concentrate (PRF) avoids need for second surgical site, and is enriched with growth factors.

Aim:

The aim of the present study to compare and clinically evaluate Bilaminar technique using Connective Tissue Graft (CTG) and Platelet Rich Fibrin (PRF) in the management of multiple Miller's class I gingival recession situations.

Materials & Methods:

Twenty patients (age group 18-40 years) were selected from the outpatient department of Periodontics , Ragas Dental college & Hospital, Chennai-119, with probing depth <3mm and seeking treatment for Miller's class I multiple gingival recessions were enrolled into this study. The selected patients were randomly assigned to one of either group. Group-A (TEST group) using Platelet Rich Fibrin and Group-B (CONTROL group) using

connective tissue graft. All the patients were treated with Bilaminar technique. Baseline to 3 months and 6 months post-surgery following parameters were recorded, Probing depth, Relative clinical attachment level, Recession depth, Width of keratinised gingiva, and Gingival phenotype. The data were statistically analysed and the significance were co-related.

Results:

Mean Recession depth, Relative clinical attachment loss and Probing depth were reduced in both the groups, but between groups it was statistically significant towards control group, from baseline to 6 months' time period. There is no any significant relation between and within groups in regarding Width of keratinised gingiva. But the gingival phenotype showed statistically significant difference between and within groups.

Conclusion:

From the above study, it was elicited that PRF was not able to achieve predictable root coverage; only increasing in gingival biotype is seen. Thus in spite of limitations CTG remains the *GOLD STANDARD*, in recession coverage.

INTRODUCTION

Periodontal plastic surgery not only addresses the functional problem but also satisfy esthetic needs of the patients. One of the common squeal of periodontitis is gingival recession. Gingival recession is defined as the displacement of the gingival tissue margins apical to the CEJ.[7] Studies on the Prevalence and incidence of gingival recession had been analyzed by various authors, **Albander and Kingman**[52] studied prevalence of gingival recession among 9,689 subjects aged between 30-90 years. They found prevalence of 1mm or more recession in people aged 30 years and older was 58 % and increased with age. Prevalence and severity were seen at buccal, than at interproximal surfaces of teeth.[40, 17] Gorman[35] found the frequency of gingival recession with age and was greater in men than in women of the same age group. Cause of gingival recession is multifactorial in nature such as age,[74] various anatomical factors such as Fenestrations and Dehiscence,[99,64] abnormal tooth Position,[33,6] aberrant Frenum,[81,92] gingival Biotype[51,8] etc. Even, pathological condition such as trauma from Occlusion, [55, 30] Vigorous tooth Brushing,[78, 98] History of periodontal disease,[35,49,5] have been implicated.

Many people may exhibit generalized gingival recession without having any awareness of the condition or others often are anxious about gingival recession for reasons such as fear of Tooth loss,[90] Dentinal Hypersensitivity,[2,1] and Poor Esthetics[5] various system have been proposed to diagnose and treat gingival recession starting from **Sullivan and Atkins** in

1968,[93] These classification were based on papilla height,[77] width of attached gingiva, vertical and horizontal component of the gingival margin. The Rationale of treating gingival recession is not only to achieve complete coverage of the root,[3] additionally eliminating plaque trap area, decreasing hypersensitivity and preventing root caries. Numerous surgical techniques have been proposed to treat marginal gingival recession,[63,43,12] In a broader perspective these treatment modality can be grouped under pediculate and non-pediculate graft procedures. Based on the surgical technique systemic review on literature have showed that connective tissue graft (CTG) pioneered by **Edel** [28] in 1974 later modified by **Langer and Langer** [63] with pedicle flap (Bilaminar technique) is currently considered to be a better surgical option in terms of attaining maximum percentage of root coverage. In terms of predictability for this procedure is 52-97.4% respectively. Especially in esthetic demanding region connective tissue graft seems to be a better choice of graft. **Karring**[58] showed that the primary determinant of tissue specificity rests within the connective tissue graft. Even though connective tissue graft is the gold stranded procedure, the disadvantages are the second surgical site, the patient discomfort, post-surgical pain, and bleeding from the donor area.[42] Numerous alternate viable materials such as guided tissue regeneration (GTR),[95,14,73] alloderm,[45,94] emdogain,[89] tissue engineered bilayered live cell therapy[76] etc. With or without biological mediators have been tried and they are intended to accelerate and mimic biologic soft tissue wound healing.

Use of different materials for root coverage, obtaining predictable and esthetic root coverage has become an important goal of periodontal plastic surgery. A recent innovation of platelet rich fibrin as an autologous source is a breakthrough in the field of medicine which enhances and stimulates soft and hard tissue healing.[86,29] The clinical application of platelets rich plasma has been extended in medical and dental fields. Platelet concentrate have been successfully applied in periodontal therapies such as in implant therapy[105], socket preservation,[45] GBR procedure,[56] GTR procedures either as sole grafting material or in combination with other materials. These Platelet concentrate contains PDGF, TGF and many other growth factors that modulate and up regulate the biomimetic of the tissue healing.[27]

Considering the novel property of platelets the present study was undertaken to find out the clinical effectiveness and evaluate the platelet rich fibrin and connective tissue graft in conjunction with coronally advanced flap in the management of multiple Millers class-I gingival recession.

AIMS AND OBJECTIVES

Present comparative clinical study aims to compare and clinically evaluate Bilaminar technique using Connective tissue graft (CTG) and Platelet rich fibrin (PRF) in the management of multiple Miller's class I gingival recession situations.

REVIEW OF LITERATURE

Among the various determinants, the gingival components have an important bearing on the esthetic nature of the smile in an individual. The term "Periodontal plastic surgery" includes "Mucogingival surgery". Until the early 1980s, mucogingival surgery was predominantly focused on the functional reconstruction of the gingival complex, with root coverage being a subordinate consideration. In the late 1980s, new surgical techniques, such as the epithelialized thick free mucosal graft and the sub-epithelial connective tissue graft, led to improved and more predictable outcomes of root coverage. With these then newly developed surgical techniques, clinicians became more capable of addressing the increased aesthetic demands presented by patients. Various procedures to improve aesthetics have a different requirement for success compared with surgery aimed at improving periodontal health. The patient plays a more important role in determining success in aesthetic procedures. The surgeon has the responsibility to clearly outline the biological possibilities, and careful examination of the expected surgical parameters is essential prior to initiation of mucogingival procedures.

Gingival recession is characterized by the displacement of the gingival margin apically from the cementoenamel junction, or CEJ.[7]

Gingival recession can be localized or generalized and be associated with one or more surfaces. Among the many factors that might predispose a patient to generalized as well as localized gingival recession, trauma caused by tooth brushing seems to be the most common predisposing factor **Khocht[61] et**

al 1993 & **O'Leary 1971.**[78] Other precipitating factors include anatomical variations such as abnormal frenulum **Donaldson 1973** [24] tooth malpositioning **Pini Prato et al 1996** [82]**,** overhanging restorative and surgical procedures and aging **PiniPrato**[82] **et al 1996**. Gingival recessions may results in hypersensitivity impaired esthetics and root caries **Hall**[39] **1989 & Anson 1999.**[10]

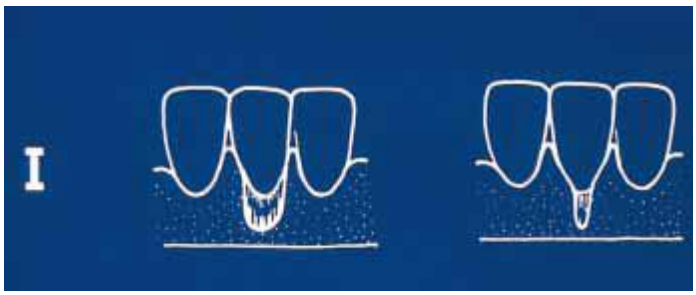
Since the presentation of gingival recession varies widely in the population, classification systems have been established to better describe it.

Sullivan & Atkins 1968 [93] used the descriptive terms "narrow", "wide", "shallow" and "deep" to classify recession into 4 groups.

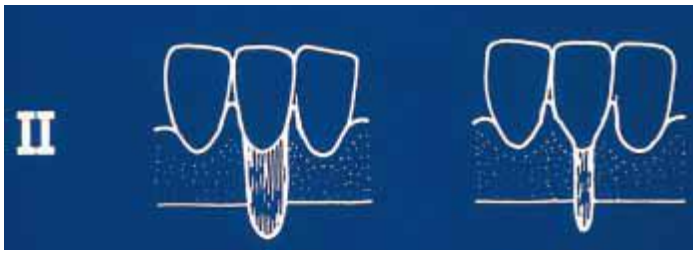
Mlinek et al 1973[72] quantified the gingival recession as "shallow narrow" clefts as being < 3mm in both dimensions.

Miller 1985 [71] proposed 4 classes of marginal tissue recession he classified gingival recession according to the height of the Inter proximal papillae adjacent to the defect area.

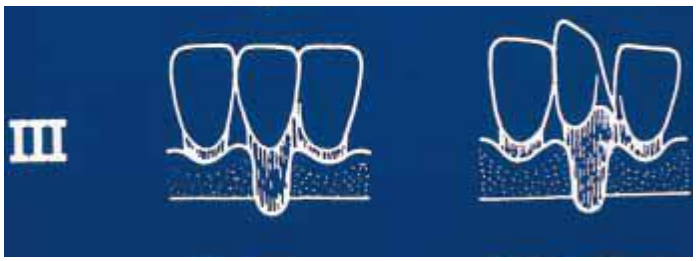
- Class I: Marginal tissue recession that does not extend to the mucogingival junction, with no periodontal loss (bone or soft tissue) in the interdental area. One hundred percent root coverage can be anticipated.



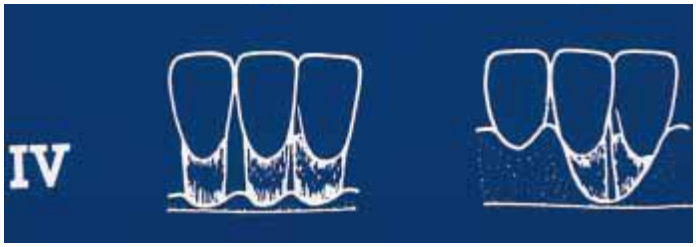
- Class II: Marginal tissue recession that extends to or beyond the muco-gingival junction, with no periodontal loss (bone or soft tissue) in the interdental area. One hundred percent root coverage can be anticipated.



- Class III: Marginal tissue recession that extends to or beyond the muco-gingival junction. Loss of interdental soft and hard tissue apical to the cemento enamel junction but coronal to the level of recession, Partial root coverage can be anticipated.



- Class IV: Marginal tissue recession that extends to or beyond the mucogingival junction. Loss of interdental soft and hard tissue, apical to the area of recession.



Norland and Tarnow et al 1998 [77] classified gingival recession based on their papillary height.

Management of gingival recession include different surgical techniques, they can be broadly classified as

1. PEDICLE GRAFTS

A. Rotational flaps

- Laterally positioned flap

- Obliquely rotated flap

- Double papillae flap

B. Advanced flaps

- Coronally positioned flap

- Semilunar flap

2. FREE SOFT TISSUE GRAFTS

A. Epithelialized (Classical Gingival Graft)

B. Non-epithelialized soft tissue graft.

3. COMBINATION GRAFTS

A. One Stage procedure

- Connective tissue graft plus pedicle graft

- Biodegradable membrane barrier plus pedicle graft

B. Two Stage procedure

- Coronally positioned previously placed soft tissue graft

- Non-biodegradable membrane barrier plus pedicle graft.

In any surgical technique it is important to differentiate between **success** and **predictability** with regard to root coverage procedures. Success relates to the average percentage of root coverage achieved, whereas

predictability describes the percent of the treated teeth in which complete root coverage is achieved.

Connective tissue graft:

The connective tissue graft was first used by **Edel[28] 1974, Broome and Taggart[15] 1976 and Donn[25] 1978** used CTG to increase the width of keratinized gingiva.

B. Langer and **L. Langer[63]** initially introduced sub-epithelial connective tissue graft technique in 1985 and outlined the indications and procedure for the same. **Nelson[75]** in 1987 modified it to further increase clinical predictability. He attained gain in clinical predictability is by use of the Bilaminar flap design to ensure graft vascularity (from the bed and the overlying flap) and a high degree of gingival cosmetics from the secondary intention healing of the connective tissue graft.

Nelson 1987 [75] in his controlled clinical study has reported mean root coverage of 88%, though **Raetzke 1985[83]** reported the root coverage of 60%-83%, **Harris** 1992[43] showed much higher (97%) root coverage in his study. Also it provides excellent aesthetics with good gingival colour match and minimal likelihood of keloid formation. Contrary to the free gingival graft, here the donor site wound is less extensive and haemorrhagic and perhaps less annoying to the patient.

Wennstrom in 1996[102], in a literature review of connective tissue procedures, reported average root coverage of 89% ranging over 50%–98%.

This was the highest among all root coverage procedures analysed. Root coverage achieved using the connective tissue graft procedure is extremely stable, and thus this procedure is taken as a "*Gold Standard*" while evaluating the efficacy of other techniques.

Yong-Moo Lee et al 2002,[103] In a, 3-year longitudinal study evaluation of sub-pedicle free connective tissue graft for gingival recession coverage. The results indicate that the connective tissue graft with a partial thickness coronal advancement pedicle is a predictable method for root coverage and, provided with optimal maintenance care, the clinical outcomes gained by this technique can be well maintained.

Cetiner D et al 2004[18] described a technique, EXPANDED MESH CONNECTIVE TISSUE GRAFT (eMCTG) for the treatment of multiple gingival recessions in 52 buccal gingival recessions to evaluate the effectiveness and predictability. The results demonstrated that the use of eMCTG technique allowed the treatment of multiple adjacent recessions with adequate wound healing and highly predictable root coverage. This procedure can be applied favourably in treating multiple gingival recessions in one surgery.

Harris R.J et al 2007[46] in a controlled comparative study, the clinical root coverage achieved with two connective tissue grafts that were removed from the same donor site at different interval and used in sub epithelial grafts for root coverage The results of the study were statistically significant changes

in recession, probing depth, width of keratinized tissue and attachment level. The second connective tissue graft produced greater mean root coverage than the first connective tissue grafts.

Harpreet Singh Grover et al in 2011[41], in a case report sub epithelial connective tissue graft is used to assess the increasing gingival biotype. The results emphasized complete root coverage along with more favourable phenotype.

Surgical technique for Connective Tissue Graft:

Broome & Taggart 1976[15] used a Brasher-Rees Knife for securing the connective tissue graft after reflection of the primary partial thickness flap.

Langer & Langer 1985[63] described the SUBEPITHELIAL CONNECTIVE TISSUE GRAFT technique for covering gingival recessions of both single and multiple adjacent teeth. He used a bilaminar procedure with the combination of connective tissue and epithelium taken from the inside of a palatal and placed under a partial thickness flap over a denuded root. The results of the study showed high success rate of 85%.

Edel 1994[28] employed a trap door approach with three incisions to harvest connective tissue graft without epithelium.

A different version of connective tissue grafts called as "envelope technique" described by **Raetzke[83] 1985.[83]**

Nelson 1987[75], Harris 1992[43] used bilaminar flap design to assure graft vascularity and a high degree of gingival cosmetics from the secondary-intention healing of the connective tissue graft. This seems to avoid the tire patch look often associated with free gingival grafts. **Nelson 1987** described the SUBPEDICLE CONNECTIVE TISSUE GRAFT (SCTG) technique which combined a connective tissue graft with a full thickness double papilla graft to cover the denuded root. It was further modified by **Harris (1992)** by using a connective tissue graft with a split thickness double papilla graft.

Bruno J.F.1994[16] presented some modifications of the original Langer & Langer technique for root coverage on areas of wide denudation. He suggested that mesiodistal length of the incision can be extended to provide easy access to the denuded root without the use of vertical incisions.

Blanes R.J & Allen E.P 1999[13] described a surgical technique for the treatment of adjacent soft tissue marginal recession. The technique combined a tunnel procedure with double lateral pedicle flaps to cover a connective tissue graft. These techniques proposed to compensate for the lack of blood supply usually associated with the tunnel technique in deep or adjacent wide recession. They observed 95% root coverage with these procedure.

Huzeler M.B & Weng D,[50] 1999 described and demonstrated a new and simplified surgical approach to harvest subepithelial connective tissue grafts from the palate. In the proposed technique, only a single incision

parallel to the gingival margin was used to access the donor site for graft preparation and harvesting grafts of variable sizes and thickness were obtained Since no band of epithelium was removed with the connective tissue graft, the palatal donor site could heal with primary intention. No stents or hemostatic agents were necessary to cover the donor site post-operatively and suturing was reduced to a minimum.

Surgical technique comparative reviews:

Ouhayoun J.P.et al 1994[80] comparative clinical study of two techniques of subepithelial connective tissue grafts for root coverage which differed with respect to the use of epithelial collar of the graft. After a six months follow-up, they demonstrated that both the procedures could accomplish root surface coverage in class I and class II recessions with reasonable esthetic results. They suggested that removal of epithelial collar gives better esthetic results.

Cordioli G et al 2001[20] retrospective clinical study of 1-1.5 years to compare 2 techniques of sub-epithelial connective tissue graft in the treatment of Millers class-1 and class-2 gingival recessions to evaluate root coverage and mucogingival changes. The treatment outcome in terms of keratinized tissue width seems to be correlated with the pre-surgical gingival dimensions and the height of the grafted tissue that is left exposed coronal to the flap margin at the end of the surgical procedure.

Da Silva R C et al 2004[21] in a randomized clinical trial compared the coronally positioned flap alone or in conjunction with a sub-epithelial connective tissue graft in the treatment of gingival recession in 11 non-smoking subjects. The results indicate that both surgical approaches are effective in addressing root coverage. When desired gain in gingival dimensions is needed, then the combination technique should be used.

Tolga S.Tozum. et al 2005[96] Comparisson of two techniques Langer and Langer & modified tunnel of sub-epithelial connective tissue graft for the treatment of gingival recession suggest that the use of SCTG in combination with a tunnel procedure may results in an increased amount of root coverage and clinical attachment gain compared to the Langer and Langer technique.

CTG vs Other Grafts Materials:

Harris R.J.2004[47] conducted a study to evaluate the short and long term root coverage results obtained with an acellular dermal matrix and sub-epithelial graft and concluded that sub-epithelial graft is a better procedure to produce more predictable and stable long term root coverage results.

McGuire M.K.2006[68] Done a comparative study of recombinant human platelet-derived growth factor-BB plus beta tricalcium phosphate and a collagen membrane to sub-epithelial connective tissue grafting for the treatment of recession defects. The results of the study revealed a favorable

tissue response to rhPDGF-BB+β-TCP and a collagen membrane and comparable clinical outcomes to connective tissue graft.

Suichi S et al 2006[89] Treated Millers class III recessions with enamel matrix derivative (emdogain) in combination with subepithelial connective tissue grafting. Soft tissue coverage of the root surfaces was achieved clinically and radiographs showed improvements in the interproximal bone defects

Joly J.C et al 2007[54] In a comparative clinical study over a 6 months period among 10 patients isolated gingival defects using a coronally positioned flap associated with sub-epithelial connective tissue grafts or an Acellular dermal matrix graft were analysed. The results revealed statistically significant greater gain in clinical attachment level, recession depth, and gingival thickness in sub- epithelial tissue graft and no differences were found in keratinized gingiva and probing depth.

E.P.Rosetti et al 2007[26] done an 18 months comparative study between sub-epithelial connective tissue graft and guided tissue regeneration for the treatment of gingival recession. It was concluded that gingival recessions treated with sub-epithelial connective tissue graft group were superior for gingival recession height (GR), root coverage (RC) and keratinized tissue width (WKT) clinical parameters, while guided tissue regeneration demonstrated better probing depth reduction.

Jung S. Han et al 2008[57] Comparative clinical study to investigate the changes in gingival dimensions and root coverage using the same surgical procedure but varying the amount of the connective tissue graft left uncovered. Both procedures resulted in successful root coverage with an increase in the width of keratinized tissue. Conclusion of the study showed that a portion of the graft exposed resulted in a greater increase in keratinized tissue, and complete coverage of graft resulted in greater root coverage.

Keceli H.G 2008[60] in a comparative clinical study, between connective tissue graft +platelet rich plasma with connective tissue graft alone in the treatment of gingival recession were studied, the results showed no difference between connective tissue graft and connective tissue graft with platelet rich plasma.

Sandro Bittencourt et al 2009[88] in his clinical study, to find the root coverage outcomes for Millers class 1 recessions obtained at 6 months using semilunar coronally positioned flap (SCPF) or with sub-epithelial connective tissue grafts, were resulted in 89.25% and 96.83% respectively. And there were no significant differences between the two groups with regard recession depth, recession width, width of keratinised gingiva, probing depth and clinical attachment loss.

Katrin Nickles et al 2010[59] In a 10 year study for Millers class 1 and class 11 recession using connective tissue graft and guided tissue regeneration

using bio-absorbable barriers, the results at 6 months were less significant compared to respective baseline, at the end of 12 months showed the results between these two groups as, Connective tissue graft caused more post-surgical discomfort but it resulted in a better outcome than GTR as perceived by patients. The long term stability of root coverage is more significant than GTR.

Nevins M.L 2010[76] A case series of tissue engineered bilayered cell therapy (LCT) for the treatment of oral mucosal defects. A bilayered construct of allogenic viable neonatal cell comprised of a lower fibroblast layer and an upper keratinocyte layer which appear to promote healing by providing the wound with extracellular matrix and expressing cytokines. It is not commercially available.

Giulio Rasperini et al 2011[34] clinical outcomes of a connective tissue graft alone or in combination with enamel matrix derivative (EMD) in the treatment of Miller's class 1/11 recessions. The mean recessions reduction was 3.9+0.8mm for EMD treated sites, and 3.6+1.5mm for the CTG alone. Corresponding root coverage was obtained in 62% of test sites compared to 47% in the control group.

Mauro Pedrine Santamaria et al 2011[67] In an experimental study, the connective tissue graft with resin glass ionomer for the treatment of gingival recession associated with non-carious cervical lesions were studied

and the result provided statistically significant gains in clinical attachment level and shallow probing depths. The percentage of cervical lesions height covered was 74.0%+22.90. Thus showed resin modified glass ionomer filling did not interfere with coverage achieved by the connective tissue graft.

Histologic review:

Harris R.J 1999[44] In a histologically study in humans using a connective tissue graft combined with a partial thickness double pedicle graft. He observed two different healing patterns. The first was characterized by a long junctional epithelial attachment that extended well beyond the original gingival margin and occasionally almost to the original bone level with minimal connective tissue adjacent to the tooth. The other pattern was a short junctional epithelium that stopped at the previously exposed root surface. There was predominately connective tissue adjacent to the tooth with some isolated areas of epithelium. Also new bone or cementum was seen. He concluded that though the procedure was successful clinically, it produces no true regeneration but heals only through repair.

Guiha et al 2001[37] done an animal study for histological evaluation of healing and revascularization of the sub-epithelial connective tissue graft. The vascularization of the connective tissue originates from the periodontal plexus, and the overlying flap. The attachment of the graft to the root surface appears to be mediated by a combination of epithelial down growth and

connective tissue attachment. There is little potential for new cementum and new bone formation.

Fabricia Ferreira Suaid et al 2008[31] In an Histometric study in dogs comparing the healing process for treating gingival recessions using platelet rich plasma with connective tissue graft and connective tissue graft alone and the results obtained were, a greater length of new cementum was observed in the sites treated with Platelet rich plasma and Connective tissue graft (2.18+0.78mm) compared to the control group (1.19+0.62mm). No statistically significant differences were observed in the remaining parameters. Thus combination of PRP with CTG was more effective in promoting new cementum formation than the graft alone.

Antonio Scarano et al 2009[11] To evaluate clinically, histologically and ultra-structurally the Acellular dermal matrix used in treatment of increasing the width of keratinized gingiva. Results obtained were clinically gained keratinized gingiva of 2.92+0.65mm observed after 3 months. After 6 weeks it was difficult to find, the acellular dermal matrix pre-existing collagen fibres.

Michael K et al 2009[69] On examination of the histologic and micro computed tomographic outcomes of the treatment of gingival recession defects either a connective tissue grafts or 0.3 mg/mL recombinant human platelet – derived growth factor on a beta-tricalcium phosphate matrix. After nine

months, sites treated with rhPDGF-BB+B-TCP showed connective tissue fibres perpendicularly inserting into newly formed cementum and alveolar bone. In CTG sites a long junctional epithelium was seen coronal to the osseous crest and connective tissue fibres ran parallel to the adjacent root surfaces, with no evidence of insertion into cementum or bone.

Systematic Review:

In recent years, many systematic reviews were published focussing on the effect of root coverage procedures for the treatment of localised gingival recession like Chambrone[19] in 2008, Oates[79] in 2003, Roccuzzo[84] in 2002. These authors reported that different surgical techniques and flap designs had been described and used in an attempt to correct gingival recession producing statistically significant improvements in gingival recession and clinical attachment level. Since the common occurrence of recession areas involving localised or adjacent teeth, evidence based information associating the results achieved by different surgical techniques can be considered as an important tool in clinical decision making.

Success of various modalities of root coverage

Root coverage procedure	No. of studies	Root coverage	
		Mean % of initial recession	Range
Rotational flaps	10	68%	41–74%
Coronally advanced flap	5	83%	70–99%
Guided tissue regeneration	9	74%	54–83%
Connective tissue graft	12	91%	52–98%
Free gingival graft	15	73%	11–87%

Source: adapted from Wennström & Pini Prato 100

Predictability of various modalities of root coverage

Root coverage procedure	No. of studies	Complete root coverage	
		Mean % of teeth	Range
Rotational flaps	1	43%	
Coronally advanced flap	5	58%	24–95%
Guided tissue regeneration	4	30%	0–42%
Connective tissue graft	9	66%	27–89%
Free gingival graft	9	57%	0–90%

Source: adapted from Wennström & Pini Prato 100

Table 7. Prospective comparative studies on the use of submerged grafts versus various root coverage procedures

Author	Study design	Defect class	Number of patients	Number of teeth	Length of study (months)	Initial recession depth (mm)	Mean % of root coverage	% teeth with complete root coverage*	Mean increase in gingival height (mm)
Nonsubmerged grafts									
Shoukone et al. (83)	Subepithelial connective tissue graft	I or II	12	12	12	4.2	52 S	–	–
	Free gingival graft	I or II	12	12		4.5	11	–	–
Jahnke et al. (57)	Connective tissue graft (envelope technique)	I and II	9 with	9	6	2.0	80 S	56	3.0 NS
	Free gingival graft	I and II	paired defects	9		2.0	43	11	3.0
Paolantonio et al. (70)	Subepithelial connective tissue graft	I and II	35	35	60	3.4 3	85 S	48.5	2.8 1 NS
	Free gingival graft	I and II	35	35		3.3 1	53	8.5	3.0 6
Advanced flap									
Wennström & Zucchelli (138)	Subepithelial connective tissue graft	I	25	50	24	4.0	98 NS	88	2.0 S
	Coronally positioned flap		32	45		4.1	87	80	1.1
Guided tissue regeneration procedures with non-resorbable barrier membrane									
Ricci et al. (85)	Subepithelial connective tissue graft	I and II	–	16	12	4.0	77 NS	–	2.1 S
	Gore-Tex + coronally positioned flap		–	18		5.0	81	–	2.3
Jepsen et al. (50)	Connective tissue graft (envelope technique)	I and II	15 with paired	15	12	2.5	87 NS	47	2.5 NS
	Gore-Tex titanium reinforced + coronally positioned flap		defects	15		3.3	87	47	1.5
Guided tissue regeneration procedures with resorbable barrier membrane									
Harris (40)	Connective tissue graft + double papilla flap	I	10	10	6	3.7	97 NS	90	3.1 S
	Guidor + coronally positioned flap	I	10	10		3.7	75	60	– 0.4
Harris (40)	Subepithelial connective tissue graft	I and II	12	18	6	3.6	95 NS	74	2.1 S
	Guidor + coronally positioned flap	I and II	12	18		3.6	92	72	0.1
Zucchelli et al. (128)	Subepithelial connective tissue graft	I and II	18	18	12	5.6	90.5 S	66	3.1 S
	Guidor + coronally positioned flap	I and II	18	18		5.8	86 S	38	0.7 S
	Gore-Tex + coronally positioned flap	I and II	18	18		5.7	80.5 NS	28	0.6 NS
Trombelli et al. (130)	Subepithelial connective tissue graft	I and II	12 with	12	6	3.0	8.1 S	50	1.6 S
	Resolut + coronally positioned flap	I and II	paired defects	12		3.1	48	8	0.0
Borghetti et al. (17)	Subepithelial connective tissue graft	I	14 with	14	6	3.0 5	76 NS	–	2.0 3 S
	Guidor + coronally positioned flap	I	paired defects	14		4.3	70	–	0.4 2
Müller et al. (72)	Connective tissue graft (envelope technique)	I and II	13	14	6	2.5	80 S	62	1.2 4 NS
	Guidor + coronally positioned flap	I and II	9	14		3.0	45	11	1.1 4

S: significant statistical difference between treatments. NS: not significant. *Statistical comparisons have not been used for this parameter because of the studies reviewed.

Platelet concentrate:

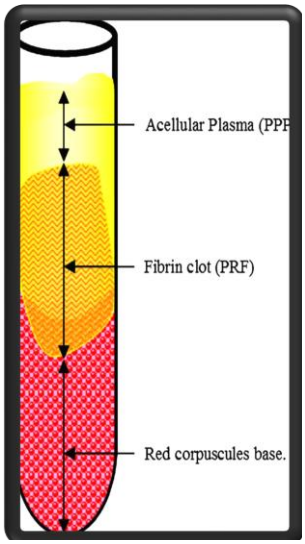
Since 1990, a greater understanding of wound, soft tissue and bone healing has revealed that there are several components within blood constituents, e.g fibrin, fibronectin, vitronectin, PDGF, TGF-B that are part of the natural healing process, which can be altered or accelerated by concentrating these factors.[9]

Platelet Biology:

Platelets are the end products of megakaryocytes and are formed in bone marrow. They have no nucleus and cannot replicate, thus the life span of platelets is 5 to 9 days. During activation, the alpha granules within platelets fuse with the platelet plasma membrane and release some of their protein contents to the surrounding called as degranulation. The alpha granules in platelets contain more than 30 bioactive proteins, many of which have a fundamental role in hemostasis and or tissue healing **Anitua E et al in 2004[9]**. These proteins include PDGF (αα, ββ, αβ isomers), TGF-β (both β1, β2 isomers), platelet factor 4, interleukin-1, platelet derived angiogenesis factor, VEGF, epidermal growth factor, platelet derived endothelial growth factor, epithelial growth factor, insulin like growth factor, osteocalcin, osteonectin, fibrinogen, vitronectin, fibronectin, and thrombospomdin-1 **Harrison P et al in 1993[48]** platelets begin actively secreting these proteins within 10 minutes after clotting, with more than 95% of the presynthesized growth factors

secreted within 1 hour. After the initial burst of PRP-related growth factors, the platelets synthesize and secrete additional growth factors for the remaining several days of their life span, **Marx RE et al in 2004**[66]

Samir Mehta et al in 2008[86] in his study platelet activation in response to tissue damage and vascular exposure results in the formation of a platelet plug and blood clot to provide hemostasis and the secretion of biologically active proteins. The composition of this naturally occurring hematoma is 95% red blood cells, 4% platelets and 1% white blood cells. But blood clot enriched with platelets reveals dramatic difference in its composition compared to natural clot with 95% platelets, 4% red blood cells, and a similar amount of white blood cells.



Wound healing can be enhanced and speeded by the use of a platelet gel that is harvested from the patient's own plasma a few minutes before it is used. The platelet rich plasma (PRP) consists of

1. Concentrated fibrin
2. Stem cells
3. Platelets

Keceli H.G 2008[60] compared connective tissue graft +platelet rich plasma with connective tissue graft alone in the treatment of gingival recession. No difference could be found between connective tissue graft and connective tissue graft with platelet rich plasma.

Sanchez et al 2003[87] have elaborated on the potential risks associated with the use of PRP. It has been discovered that use of bovine thrombin used in preparation of PRP may be associated with the development of antibodies to the factors V, XI and thrombin, resulting in coagulopathies. Bovine thrombin preparations have been shown to contain factor V, which could result in the stimulation of the immune system when challenged with a foreign protein.

David M Dohan et al in 2006[22] In a laboratory analysis, 10ml blood was collected from 15 healthy volunteers without anticoagulant, PRF was prepared according to PRF protocol, compared PRP and PRF, showed no significant difference between the cytokine measurement. Secondly, the values obtained in PRF clot exudates are all significantly higher than those measured in plasma and sera samples. Among cytokines measured IL-1B, IL-16 and TNF-A to anti-inflammatory cytokines, such as IL-4. Were identical for PRP and PRF. Only the VEGF was an exception, with particularly high serologic concentrations in PRF.

Griffin TJ et al in 2004[36] in a case report by using platelet concentrate gel in a sponge carrier, combined with a coronally positioned flap procedure,

showed complete root coverage was achieved, optimal esthetic results, with excellent soft tissue contour and texture were observed.

Mark P Kraver 2011[65] et al Trapping the platelets and leukocytes inside the fibrin clot helps in many ways.

1. Transforming growth factor beta, is a protein that assists in cellular differentiation and proliferation
2. Platelet derived growth factor helps bring in mesenchymal stem cells into the areas as well as differentiate and proliferate endothelial cells
3. Insulin like growth factors helps healing cells from dying so fast and continue healing longer
4. Growth factors will work on type 1 collagen to form fibroblasts and osteoblasts
5. Release cytokines to attract the healing response of the body
6. Leukocytes will enhance the body's own inflammatory process to heal quicker
7. Fibrin network increases the blood flow into the area with vascular endothelial growth factor
8. Neutrophil degrades the site for wound remodeling and bring in the macrophages to clean up the site.

The newer extract known as platelet rich fibrin (PRF) is a second generation platelet concentrate widely used to accelerate soft and hard tissue

healing. Its advantages over the better known platelet rich plasma(PRP) include ease of preparation, application, minimal expense, lack of biochemical modification (no bovine thrombin or anticoagulant is required). PRF is a strictly autologous fibrin matrix containing a large quantity of platelet and leukocyte cytokines.

PRF was prepared by technique introduced by **Dr.Joseph Choukroun** in France, here patients own blood 10ml is withdrawn without any anticoagulant or chemicals is immediately centrifuged at 2700rpm for 12 minutes. PRF is formed in test tube as gel between lighter clear platelet poor plasma and the packed red blood cells. It is then lightly pressed to extract the growth factors used to rehydrate grafting materials. It is also can be used as a filler for bone grafts and as healing membrane liner to accelerate the healing process up to two times faster.

Fu-Mei Huang et al 2010[32] PRF was prepared by choukroun's technique from 6 healthy volunteers. Human Dental Pulp Cells (DPC's) were derived from healthy individuals undergoing extraction for third molars. Cell proliferation resulting from PRF was evaluated by colorimetric assay. Western blot was used to evaluate the expression of osteoprotegerin (OPG). Alkaline phosphatase (ALP) activity was examined by substrate assay. And the results concluded that PRF did not interfere with cell viability of DPCs. DPCs were observed to attach at the edges of PRF by phase contrast microscopy. PRF was found to increase DPC proliferation during 5-day incubation period. PRF was

found to increase OPG expression in a time –dependant manner. ALP activity was also significantly up-regulated by PRF.

Tsai CH et al 2009[97] He reported that PRF can stimulate cell proliferation of osteoblasts, gingival fibroblasts and periodontal ligament cells but suppress oral epithelial cell growth in vitro. These cell type-specific actions of PRF may be beneficial for periodontal regeneration.

Yu-Chao Chang et al 2011[104] PRF prepared by Choukrons technique was used as sole grafting material in periodontal intrabony defects and parameters such as probing depth, clinical attachment level, radiographic bone level between baseline and 6 months were analysed and the results concluded that from a clinical and radiologic point of view at 6 months after surgery, the use of PRF as the sole grafting material seems to be an effective modality of regenerative treatment for intra-bony defects, showing reduction in probing depth and gain in clinical attachment level, and an increase of 1.6 and 1.3 fold compared with each preoperative radiography.

Joseph Choukroun, et al in 2006[56] Nine sinus floor augmentations were performed. In 6 sites, PRF was added to FDBA particles (test group), and in 3 sites FDBA without PRF was used (control group). Four months later for the test group and 8 months later for the control group, bone specimens were harvested from the augmented region during the implant insertion procedure. These specimens were treated for histologic analysis. Histologic evaluations

reveal the presence of residual bone surrounded by newly formed bone and connective tissue. After 4 months of healing time, histologic maturation of the test group appears to be identical to that of the control group after a period of 8 months. Moreover, the quantities of newly formed bone were equivalent between the 2 protocols.

Sofia Aroca et al 2009[91] Comparing modified coronally advanced flap with or without PRF was used in Millers class 1 and 11 gingival recession, and studied at 1,3 and 6 months and results obtained were mean recession coverage with PRF is 52% and compared to without PRF is 70% but the gingival thickness were increased in PRF used group.

Rosano G et al in 2011[85] In this case report, a regenerative technique using autologous PRGF fibrin plug for preservation of soft tissue architecture around an implant immediately placed into an extraction site in the anterior maxilla, and the results showed a pleasant gingival contour at the facial aspect after a single stage surgery.

David M et al 2010[22] To assess the three dimensional architecture and cell composition of a Choukroun's PRF, after centrifugation blood analyses were performed on the residual waste plasmatic layers after clotting PRF clots. PRF clots and membranes were processed for examination of light microscopy and scanning electron microscopy. Results were shown that approximately 97% of the platelets and >50% of the leukocytes were concentrated in the clot. Platelets and fibrin formed large clusters of coagulation in the first millimetres

of the membrane beyond the red blood cell base. The fibrin network was dense and mature.

E.Lucarelli et al 2010[27] Platelet rich fibrin were analysed for its physical properties, fibrin, and mesenchymal stem cells action. Macroscopically the PRF is a translucent yellow white disk. PRF is easy to handle and does not tear when manipulated with forceps. Confocal microscopy was used to observe the fibrin network, PRF consisted of a very compact, coarse, fibrin network. The fibres are organised in twisted parallel strands and bundles, frequently reaching considerable diameters up to 1.1um.

Mechanical testing showed that PRF with a tear elastic modulus of 937.3+314.6 kPa and stress at break of 1476.0+526.3 kPa, while elongation at break reaches 146.3%+33.8 kPa. Mechanical properties of samples kept refrigerated in a saline solution for 18 days were not significantly different compared to the ones measured after 5 days from preparation. The concentration of growth factors was greater at day 1 compared to day 2,3, and 7. The results of methylene blue assay performed on the mesenchymal stem cells showed increase in proliferation of 5%, 10% and 20% was tested up to 72 hours.

Recently studies have demonstrated that the PRF membranes has a very significant slow-sustained release of key growth factors for at least 7 days and up to 15 days, which means that the PRF membrane stimulates its own

environment for a significant time during remodelling. The properties of this natural fibrin bio material thus offer great potential during wound healing. It has been clearly demonstrated that fibrin matrix leads directly to angiogenesis. Fibrin, constitutes a natural support to immunity and reduce inflammatory process. PRF itself can be recognized as an autologous bio-material. PRF as membrane and grafting material offers an improved space making effect of the barrier, which is conducive to cell events leading to periodontal regeneration and facilitation of mineralized tissue formation due to osteoconductive/ osteoinductive properties possibly inherent in PRF.

Lafzi A et al in 2011[62] in a randomized clinical trial, among 20 non-smoker patients, coronally advanced flap compared with coronally advanced flap and PDGF, after 3 months the mean root coverage was 43+34.9% in the CAF group and 61+23.5% in the CAF+PDGF group. While the PRGF enhanced the outcomes of CAF especially throughout the first month, it offered no clinical advantage over CAF alone during subsequent 2 months.

MATERIALS AND METHODS

The patients were selected from the outpatient of the Department of Periodontics, Ragas Dental College and Hospitals, Chennai, were enrolled into the study groups. Twenty healthy patients in the age group of 18-40yrs (both male & female) seeking treatment for Millers class-1 multiple gingival recession were enrolled in to the study. At baseline examination **M**illers class-1 multiple gingival recessions were documented with dental casts, clinical photographs, and clinical parameters were recorded. Clinical parameter for the recession was measured by using a standard **W**illiams periodontal probe. Customized acrylic stent used to measure the recession depth, probing depth, and clinical attachment level, and the gingival phenotype with the standard reference point for easy reproducibility during recall visits.

Pre-surgical Protocol:

All patients were informed about the type of treatment to be rendered and their consents were obtained prior to the treatment. Every patient were educated and motivated for the maintaining oral hygiene. Thereafter each patient had the initial phase of treatment such as scaling and root planning.

Patients were randomly assigned in to two groups for class-1 recession coverage using coronally advancement flap with Platelet rich Fibrin membrane as graft (PRF) or connective tissue graft (CTG).

Group-A: Test group: class I multiple recessions were treated using Platelet concentrate, in the form of Platelet rich fibrin as membrane in conjunction with coronally advancement flap (n=10).

Group-B: Control group: class I multiple gingival recession treated with connective tissue graft (SCTG) in conjunction with coronally advancement flap (n=10).

The surgical procedure was carried out identically for both the groups by the single operator. The clinical parameters, probing depth, clinical attachment level, width of keratinized tissue, recession depth, phenotype, were recorded at baseline, 3 months and 6 months and the results were statistically analysed. All the twenty patients who participated in the study were assessed throughout the study period (6 months) for the complications and maintenance care. No postsurgical complications and unevent reactions reported throughout the study period.

Patient Selection:

Twenty systemically healthy patients in the age group of 18-40 years (both males and females) were selected for the treatment of class-1 multiple gingival recessions from the outpatient Department of Periodontics, Ragas Dental College and Hospitals, Chennai-119.

The following were the inclusion and exclusion criteria for this study.

Inclusion Criteria

1. Patients in the study groups displayed presence of plaque and bleeding on probing < 20% of the periodontal sites, throughout the study period
2. Patient who had not undergone any periodontal surgery within 12 months.
3. Multiple tooth class-I Millers recession, involving the anterior esthetic zone.
4. Probing depth <3mm at the recession site.
5. Radio graphically no evidence of interdental bone loss.

Exclusion Criteria

1. Non co-operative patients.
2. Pregnant and lactating mothers.
3. Any systemic conditions that could affect the outcome of mucogingival therapy.(Recession management)
4. Patients with known allergy to materials and medications.
5. Patients with known risk factors and risk modifiers.
6. Smokers
7. Tooth that were treated for non-vital, root caries at the surgical site

Armamentarium:

1. Mouth mirror. (No: 5)

2. Williams periodontal probe with marking of 10mm (Equinox)

3. Tweezers

4. Tissue holding forceps (non-toothed)

5. Dappen dish

6. Stainless steel bowl

7. Kidney tray

8. Clear Acrylic stent

9. 20 ml saline irrigation syringes – 2 nos.

10. Normal physiological saline 500ml bottles (0.9%w/v)

11. Chlorhexidine mouth rinse (0.2%)

12. Disposable suction tips

13. Lignocaine hydrochloride with 1:80000 adrenaline (2%)

14. Bard Parker handle

15. Bard Parker blade No. 15

16. Periosteal elevator

17. Surgical curettes (area specific gracey currettes 1-14, Hu-Friedy)

18. Curved Goldman fox scissors

19. Castroviejo scissors

20. Castroviejo needle holder

21. 4-0 Vicryl absorbable sutures

22. Periodontal dressing-Coe-pack (Non-Eugenol pack)

23. No.20 Reamer

24. Petri-Dish

25. Vaccutainer

26. Centrifuge- (Electronic digital)

28. IV Teflon

MATERIALS:

Harvesting PRF

PRF was prepared by technique introduced by **Dr. Joseph Choukroun** in France, here patients own blood 10ml is withdrawn without any

anticoagulant or chemicals is immediately centrifuged at 2700rpm for 12 minutes. PRF is formed in test tube as gel between lighter clear platelet poor plasma and the packed red blood cells. The Vaccutainer is kept in straight position without shaking, the upper part clear plasma is pipetted out, then the remaining PRF gel and the bottom part RBC's are left in tube, then tilting the tub in approximate 45 degree angle by using the tweezer the PRF gel is retrieved out, the few RBC'S sticking to the PRF gel is sliced out. Now the gel is placed on the wet gauze bed in the petridish, the gel is again covered with wet gauze, with uniform force; it is then lightly pressed to make as membrane. The membrane obtained is folded and trimmed to required size of the defect, then placed in the recipient site. The above procedure procuring blood from patient PRF isolation making as membrane and suturing should be done less than 20 minutes.

Clinical parameters

All clinical recordings of the recession defect were recorded by a single examiner at the baseline, 3 months and 6 months. All the measurements were measured using standard Williams periodontal probe. Customized clear acrylic stents with reference points were fabricated for each patient to assist in the standardization of the measurements. The acrylic stents were fabricated so as to cover the incisal or occlusal $1/3^{rd}$ of the adjacent tooth surfaces on either side. Grooves were created on the labial aspect of the stent that coincides with the mesio-buccal, mid-buccal, and disto-buccal line angles of the tooth surface

with recession to obtain a reproducible clinical recording during subsequent recall.

Width of keratinized gingiva:

Width of Keratinized gingiva is measured clinically by measuring the distance between stent reference point to the mucogingival line and subtracting the distance between the stent reference point to the base of the gingival sulcus.

Probing depth (PD):

The distance between the base of the sulcus to the most apical point of the gingival margin, using customized acrylic stent with grooves in the mesio-buccal, mid-buccal and disto-buccal region. The grooves were used for standardization and reproducibility during recall visits at baseline, 3 months, and 6 months period. Post-operative changes at the sites were subtracted from the pre-operative value to obtain the mean amount of root coverage.

Relative Clinical attachment level (rCAL):

The distance between the stent reference point and the base of the sulcus using customized acrylic stent with grooves in the mesio-buccal, mid-buccal and disto-buccal region. The grooves were used for standardization and reproducibility during recall visits at baseline, 3 months& 6 months period.

Post-operative changes at the sites were subtracted to obtain the mean amount of root coverage.

Recession depth (RD):

The distance between the CEJ and the most apical point of the gingival margin was measured using standard Williams's periodontal probe. Recession depths at the sites were measured using customized acrylic stents with grooves in the mesio-buccal, mid-buccal and disto-buccal region. The grooves were used for standardization and reproducibility during recall visits at baseline, 3 months, and 6 months period. Post-operative changes at the sites were subtracted to obtain the mean amount of root coverage. Percentage root coverage was calculated as

$$\frac{\text{GR baseline} - \text{GR 6 months}}{\text{GR baseline}} \times 100$$

Thickness of gingiva:

It was determined at the mid-buccal location at about 2mm from the marginal gingiva with a no:20 reamer. The reamer was inserted perpendicular to the mucosal surface, through the soft tissue with light pressure until a hard surface was felt. The silicon stopper was then placed in tight contact with the soft tissue surface. After careful removal of the reamer, the penetration depth was measured.

Surgical procedure:

All patients enrolled in the study groups (test & control) at initial examinations were assessed for all the clinical parameters. Surgical procedures were performed by a single operator. Surgery was carried out in the OP Department of Periodontics under strict aseptic and sterile environment. The patients were instructed to use pre-procedural rinse with 10 ml of 0.2%of Chlorhexidine mouth rinse before the surgery.

Local anaesthetic with lignocaine hydrochloride 2% with adrenaline 1:80000 was administered at the recipient sites. Intrasulcular incision was made at the recipient site extending to the adjacent middle of the papilla, with two vertical releasing incisions made at the mesial and distal line angles of the adjacent teeth. A split thickness muco-periosteal flap was elevated up to the mucogingival junction and a periosteal release incision was made to eliminate tension within the flap for advancement coronally. The facial portion of the interdental papilla was de-epithelialized at the coronal 1/3rd aspect to provide a connective tissue bed for easy suturing. The exposed root surface was planned with area specific curettes.

Group-A Platelet Rich Fibrin (PRF): The PRF prepared by Choukron's technique (i.e) using patients 10ml own blood. The blood collection was performed quickly and the tubes were immediately centrifuged at 2700rpm at 12 minutes, at room temperature. After centrifugation the test

tube contains middle jelly layer/clot of white translucent PRF, which is then removed with sterile tweezers, separated from RBC base using scissors and then carefully placed on wet gauze, and gauze placed over it subjected to uniform pressure to squeeze out remaining serum/plasma and made into a membrane. This membrane is folded into required size and placed on the recipient bed and sutured to stabilize it. The papilla is de-epithelialized for ease in suturing. Then the recipient flap was coronally advanced and positioned on to the de-epithelialized papillary area. The flap was stabilized using simple interrupted sutures (4.0 Vicryl suture material). A non eugenol pack (Coe-pack) was placed to cover the wound site.

Group-B Connective tissue graft (CTG): Closed approach technique was used to harvest the CTG from the palate (distal of canine to the mesial of I molar). Donor site is sutured using silk suture. A pre-fabricated acrylic stent was used to reduce the post-operative bleeding and discomfort. The harvested CTG graft was trimmed and shaped to fit the recipient site and was placed over the denuded root surface. The graft was stabilized at or above the CEJ to the papilla on either side of the graft using resorbable sutures. Then the recipient flap was coronally advanced and secured to the de-epithelialized papilla using similar sutures. Post-operative non-eugenol periodontal (Coe – pack) pack was placed to cover the wound site.

Post-Operative care:

Verbal and written post-operative instructions were given to all the subjects. Antibiotics (Amoxicillin 500 mg 9 capsules thrice daily for 3 days) and analgesics (Ibuprofen 400mgs thrice daily for 3 days), along with 0.2% of Chlorhexidine gluconate mouth rinse were prescribed for the first one week post operatively. The subjects were instructed refrain from brushing so to avoid trauma to the treated area. The recall visits were done at 5 days, followed by 2 weeks, 1month, 3 months and 6 months post surgically. In recall visits the patients' oral hygiene status was monitored and any adverse events of surgery and healing response of the tissues were recorded. Clinical parametric measurements were recorded during 3rd month and 6th month post-operatively.

The instructions given includes,

1. Rest on the day of surgery
2. If bleeding noticed pressure application with sterile cotton for 10 minutes, if still bleeds report to surgeon.
3. Avoid hot/spicy or any hard food
4. Report to surgeon if dressing dislodged at any time
5. Take prescribed medication regularly
6. Return 5 days after surgery

7. Do not brush that area till speculated time, only clean surgical site with sterile cotton
8. Report at regular intervals to dentist.

Recall visit:

Out of 20 patients who participated in Miller's – Class I recession coverage. One patient in the test group discontinued from the study during at the end of the first month. Of the remaining 9 patients, 8 patients in the control group completed the stipulated time period of 6 months. The remaining patients are having recall of 2 months' time period. Similarly in the control group, out of 10 patients, 8 patients completed 6 months follow up period successfully. The remaining 2 patients completed a follow up of 1 month period.

PROFORMA

Name:

Age/Sex:

Address:

Date:

Phone No:

Chief Complaint:

History of Chief Complaint:

Past Dental History:

Past Medical History:

Recession site:

Clinical Measurement of Recession Defect

Clinical Parameters	**Baseline**	**3 months**	**6 months**
Width of keratinized gingiva (mm)			
Probing Depth (mm)			
Relative Clinical Attachment Level (mm)			
Recession depth (mm)			
Thickness of gingiva l(mm)			

STATEMENT OF INFORMED CONSENT

Patient name: Date:

I have been explained about the nature and purpose of the study in which I have been asked to participate. I understand that, I am free to with draw my consent and discontinue at any time without prejudice to me or effect on my treatment.

I have been given the opportunity to ask questions about the procedure. I have also given consent for taking pre and post-operative photographs. I hereby give consent to be included in the clinical study "Platelet rich fibrin and autogenous sub epithelial connective tissue graft in the treatment of class I gingival recession-A 6 months comparative study"

Signature of the PG Student **Signature of the patient**

Signature of the HOD

Table 1

Group- A: - Test group (PRF+CAF)

Group-A, width of keratinized gingiva in mm Over a period of time			
S.No.	**Baseline**	**Third month**	**Sixth month**
1	2.5	2.0	2.5
2	2.0	1.5	2.0
3	4.5	4.5	4.5
4	4.5	4.5	4.5
5	3.0	2.0	2.5
6	3.0	2.5	2.5
7	2.5	2.0	2.5
8	3.5	2.0	3.5
9	2.5	2.5	2.5
10	3.0	3.0	3.0
11	4.0	3.5	4.0
12	4.0	4.0	4.0
13	3.5	XX	XX
14	3.5	XX	XX
15	2.5	2.0	2.0
16	2.5	2.0	2.5
17	2.5	2.0	2.0
18	2.5	2.0	2.5
19	3.0	2.5	X
20	3.0	2.5	X

X= Denotes the patient who haven't completed 6 months post-operative period.

XX= Denotes the patient who discontinued in course of the study period.

Table 2

Group-B:- Control group (CTG+CAF)

Group-B, width of keratinized gingiva in mm over a period of time			
S.No.	**Baseline**	**Third month**	**Sixth month**
1	3.5	3.0	3.5
2	4.5	3.5	4.5
3	4.5	3.5	4.5
4	4.5	4.0	4.5
5	2.5	2.5	3.0
6	3.5	3.5	2.5
7	3.5	3.5	3.5
8	3.5	3.5	4.0
9	2.5	2.5	3.0
10	3.0	3.0	3.0
11	3.0	3.0	3.0
12	2.5	2.5	2.5
13	2.5	2.0	2.5
14	2.5	2.0	2.0
15	4.5	XX	XX
16	4.5	XX	XX
17	3.5	3.5	3.5
18	3.5	3.5	3.5
19	2.5	XX	XX
20	3.5	XX	XX

X= Denotes the patient who haven't completed 6 months post-operative period.

XX= Denotes the patient who discontinued in course of the study period.

Table 3

Group-A:- Test group (PRF+CAF)

Group-A probing depth in mm over a period of time									
S.No.	**Baseline**			**Third month**			**Sixth month**		
	Mesial	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**
1	2	1	2	2	1	1	2	1	1
2	2	1	2	2	2	1	2	1	1
3	1	1	1	2	1	1	2	2	2
4	1	1	1	2	2	1	2	1	2
5	2	1	1	2	1	1	2	1	2
6	2	1	2	2	1	2	1	1	1
7	2	1	2	2	1	1	1	1	1
8	2	2	2	1	1	1	1	1	1
9	2	2	2	1	1	0	1	1	1
10	2	2	3	1	1	1	1	1	1
11	3	2	2	2	1	2	2	1	2
12	2	2	2	1	1	1	1	1	1
13	2	1	2	XX	XX	XX	XX	XX	XX
14	1	1	1	XX	XX	XX	XX	XX	XX
15	2	1	2	2	1	1	2	1	1
16	2	1	1	2	2	2	2	2	1
17	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1
19	2	1	1	2	1	2	X	X	X
20	2	1	2	2	1	2	X	X	X

X= Denotes the patient who haven't completed 6 months post-operative period.

XX= Denotes the patient who discontinued in course of the study period.

Table 4

Group –B:- Control group (CTG+CAF)

Group-B probing depth in mm over a period of time									
S.No.	**Baseline**			**Third month**			**Sixth month**		
	Mesial	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**
1	2	2	2	1	1	1	1	1	1
2	2	2	2	1	1	1	1	1	1
3	1	1	1	1	1	1	1	1	1
4	1	1	1	1	1	1	1	1	1
5	2	1	1	1	1	1	1	0	1
6	2	1	2	1	0	0	1	1	1
7	2	1	1	2	1	2	2	1	2
8	2	1	1	2	1	2	2	1	2
9	2	2	2	1	1	1	1	2	1
10	2	2	2	1	1	1	1	1	1
11	2	1	2	1	1	1	1	1	1
12	2	1	2	1	1	1	1	0	1
13	1	1	1	1	0	1	1	0	1
14	1	1	1	1	1	1	1	1	1
15	2	1	2	XX	XX	XX	XX	XX	XX
16	2	2	2	XX	XX	XX	XX	XX	XX
17	3	2	2	1	1	1	1	1	1
18	2	3	2	1	2	1	1	2	1
19	2	2	2	XX	XX	XX	XX	XX	XX
20	2	2	2	XX	XX	XX	XX	XX	XX

X= Denotes the patient who haven't completed 6 months post-operative period.

XX= Denotes the patient who discontinued in course of the study period.

Table 5

Group-A:- Test group:- (PRF+CAF)

Group-A Relative clinical attachment level in mm over a period of time									
S.No.	**Baseline**			**Third month**			**Sixth month**		
	Mesial	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**
1	8	8	8	7	7	4	6	6	6
2	8	8	8	7	8	6	7	6	6
3	5	7	7	8	8	8	7	8	8
4	5	6	5	8	9	7	7	7	7
5	7	6	6	7	7	7	7	7	8
6	7	7	7	7	7	7	6	6	6
7	8	8	7	6	5	5	5	5	5
8	7	6	7	5	5	5	5	6	5
9	8	9	8	7	8	6	7	8	6
10	8	8	9	6	6	6	6	7	6
11	8	8	7	6	6	6	6	6	7
12	7	8	7	5	6	6	6	6	6
13	6	6	7	XX	XX	XX	XX	XX	XX
14	7	6	5	XX	XX	XX	XX	XX	XX
15	8	7	8	6	6	5	7	6	6
16	8	8	7	7	6	6	7	8	6
17	6	7	6	5	6	5	6	7	7
18	6	7	6	5	6	6	6	6	6
19	5	6	6	7	7	7	X	X	X
20	8	6	6	6	5	7	X	X	X

X= Denotes the patient who haven't completed 6 months post-operative period.

XX= Denotes the patient who discontinued in course of the study period.

Table 6

Group-B:- Control group (CTG+CAF)

Group-B Relative clinical attachment level in mm over a period of time									
S. No.	**Baseline**			**Third month**			**Sixth month**		
	Mesial	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**
1	7	7	8	6	5	5	5	5	5
2	8	7	6	6	6	6	6	6	6
3	6	7	6	5	5	5	5	5	5
4	6	7	6	5	6	5	5	6	5
5	7	8	6	5	5	5	5	5	5
6	6	6	6	5	5	4	5	6	6
7	7	7	7	6	5	6	7	5	5
8	7	8	7	6	6	6	6	5	6
9	8	9	8	5	6	5	5	7	5
10	8	8	8	5	6	5	5	5	5
11	8	8	8	5	6	6	5	6	7
12	8	7	8	6	6	6	6	5	6
13	6	7	6	7	5	4	7	5	7
14	6	7	6	5	5	5	5	5	5
15	7	8	7	XX	XX	XX	XX	XX	XX
16	7	9	8	XX	XX	XX	XX	XX	XX
17	8	8	7	6	6	6	6	6	5
18	7	8	7	5	6	5	5	7	5
19	7	9	8	XX	XX	XX	XX	XX	XX
20	8	7	7	XX	XX	XX	XX	XX	XX

X= Denotes the patient who haven't completed 6 months post-operative period.

XX= Denotes the patient who discontinued in course of the study period.

Table 7

Group-A:- Test group(PRF+CAF)

Group-A Recession depth in mm over a period of time									
S. No.	**Baseline**			**Third month**			**Sixth month**		
	Mesial	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**
1	6	7	6	5	6	5	4	5	5
2	6	7	6	5	6	5	5	5	5
3	4	6	6	6	7	7	5	6	6
4	4	5	4	6	7	6	5	6	5
5	5	5	5	5	6	6	5	6	6
6	5	6	5	5	6	5	5	5	5
7	6	7	5	4	4	4	4	4	4
8	5	4	5	4	4	4	4	5	4
9	6	7	6	6	7	6	6	7	6
10	6	6	6	5	5	5	5	6	5
11	5	6	5	4	5	4	4	5	5
12	5	6	5	4	5	5	5	5	5
13	4	5	5	XX	XX	XX	XX	XX	XX
14	6	5	4	XX	XX	XX	XX	XX	XX
15	6	6	6	4	5	4	5	5	5
16	6	7	6	5	4	4	5	6	5
17	5	6	5	4	5	4	5	6	6
18	5	6	5	4	5	5	5	5	5
19	4	5	5	5	6	5	X	X	X
20	6	5	4	4	4	5	X	X	X

X= Denotes the patient who haven't completed 6 months post-operative period.

XX= Denotes the patient who discontinued in course of the study period.

Table 8

Group-B:- Control group(CTG+CAF)

Group-B Recession depth in mm over a period of time									
S.No.	**Baseline**			**Third month**			**Sixth month**		
	Mesial	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**	**Mesial**	**Mid.facial**	**Distal**
1	5	7	6	5	4	4	4	4	4
2	6	5	4	5	5	5	5	5	5
3	5	6	5	4	4	4	3	4	4
4	5	6	5	4	5	4	4	5	4
5	5	7	5	4	4	4	4	5	4
6	4	5	4	4	5	4	4	5	5
7	5	6	6	4	4	4	5	4	5
8	7	7	6	4	5	4	4	4	4
9	6	7	6	4	5	4	4	5	4
10	6	6	6	4	5	4	4	4	4
11	6	7	6	4	5	5	4	5	6
12	6	7	6	5	5	5	5	5	5
13	5	6	5	6	5	6	6	5	6
14	5	6	5	4	4	4	4	4	4
15	5	7	5	XX	XX	XX	XX	XX	XX
16	5	7	6	XX	XX	XX	XX	XX	XX
17	5	6	5	5	5	5	5	5	4
18	5	6	5	4	4	4	4	5	4
19	5	7	6	XX	XX	XX	XX	XX	XX
20	6	5	5	XX	XX	XX	XX	XX	XX

X= Denotes the patient who haven't completed 6 months post-operative period.

XX= Denotes the patient who discontinued in course of the study period.

Table 9

Group-A:- Test group (PRF+CAF)

Group-A Gingival Phenotype in mm over a period of time			
S. No.	**Baseline**	**Third month**	**Sixth month**
1	0.5	1.0	1.0
2	0.5	1.0	1.5
3	0.5	1.0	1.0
4	1.0	1.5	2.0
5	0.5	1.0	1.5
6	1.0	1.5	1.5
7	1.5	2.0	2.0
8	0.5	1.0	1.0
9	0.5	1.0	1.0
10	1.0	1.5	1.5
11	1.0	1.5	1.5
12	0.5	1.0	1.0
13	0.5	XX	XX
14	0.5	XX	XX
15	1.0	1.0	1.0
16	0.5	0.5	0.5
17	0.5	1.0	1.0
18	1.0	1.0	1.5
19	0.5	1.0	X
20	0.5	1.0	X

X= Denotes the patient who haven't completed 6 months post-operative period.

XX= Denotes the patient who discontinued in course of the study period.

Table 10

Group-B:- Control group (CTG+CAF)

Group-B Gingival Phenotype in mm over a period of time			
S.No.	**Baseline**	**Third month**	**Sixth month**
1	0.5	1.5	1.5
2	0.5	1.5	1.5
3	1.0	2.0	2.0
4	1.0	1.5	2.0
5	1.5	2.0	2.0
6	0.5	1.0	1.0
7	0.5	1.5	1.5
8	0.5	1.5	2.0
9	0.5	1.0	1.0
10	1.0	2.0	2.5
11	0.5	1.5	1.5
12	0.5	0.5	1.0
13	1.0	1.5	1.5
14	1.0	1.5	1.5
15	0.5	XX	XX
16	0.5	XX	XX
17	1.0	1.5	1.5
18	1.0	1.5	2.0
19	0.5	XX	XX
20	0.5	XX	XX

X= Denotes the patient who haven't completed 6 months post-operative period.

XX= Denotes the patient who discontinued in course of the study period.

STATISTICAL ANALYSIS

The SPSS software package was used for statistical analysis.

Clinical parameters between the two groups were tabulated and the mean changes in the clinical parameters were subjected to statistical analysis. Intra group analysis was assessed using Wilcoxons signed rank test, for each patient at baseline, 3 months and 6 months. Similarly inter group analysis was assessed by Mann-Whitney U non- parametric test at baseline, 3 months and 6 months time period. The mean value was expressed as a level of statistical significance with the P-value of <0.01 considered as highly significant at 1% level and P-value <0.05 was considered as significant at 5% level, P-value >0.05 was considered not statistically significant.

Table 13: INTER-GROUPS COMPARISION OF MEAN CLINICAL PARAMETRIC VALUES AT DIFFERENT TIME INTERVAL

PARAMETERS	TIME PERIOD	TEST GROUP MEAN ± SD	CONTROL GROUP MEAN ± SD	P VALUE/B-3Months-6Months	SIGNIFICANCE
PROBING DEPTH(mm)	BASELINE	1.56 ± 0.43	1.66 ± 0.44	0.472	≥0.05/NS
	3 MONTHS	1.34 ± 0.35	1.04 ± 0.31	0.012	≤0.05/S
	6 MONTHS	1.28 ± 0.32	1.06 ± 0.30	0.045	≤0.05/S
RelativeCAL (mm)	BASELINE	6.96 ± 0.92	7.23 ± 0.68	0.306	≥0.05/NS
	3 MONTHS	6.36 ± 0.86	5.43 ± 0.41	0.00	≤0.001/HS
	6 MONTHS	6.51 ± 0.90	5.51 ± 0.41	0.00	≤0.001/HS
RECESSION (mm)	BASELINE	5.43 ± 0.64	5.66 ± 0.55	0.226	≥0.05/NS
	3 MONTHS	5.01 ± 0.82	4.45 ± 0.48	0.024	≤0.05/S
	6 MONTHS	5.12 ± 0.56	4.40 ± 0.51	0.002	≤0.01/S
KERATINISED GINGIVA (mm)	BASELINE	3.10 ± 0.71	3.40 ± 0.77	0.211	≥0.05/NS
	3 MONTHS	2.61 ± 0.91	3.06 ± 0.60	0.104	≥0.05/NS
	6 MONTHS	2.93 ± 0.87	3.31 ± 0.77	0.208	≥0.05NS
GINGIVAL PHENOTYPE (mm)	BASELINE	0.70 ± 0.29	0.72 ± 0.30	0.794	≥0.05/NS
	3 MONTHS	1.15 ± 0.35	1.46 ± 0.38	0.023	≤0.05/S
	6 MONTHS	1.28 ± 0.40	1.62 ± 0.42	0.027	≤0.05/S

P.value: Between baseline 3 months and 6 months' time is ≥ 0.05 denotes, not statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.05 denotes statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.01 denotes statistically significant at 1% level

P.value: Between baseline 3 months and 6 months' time is ≤0.001 denotes statistically significant at **Less** than 1% level.

Clinical Parameters:

PROBING DEPTH

Probing depth: Group-A (PRF+CAF)

At baseline the mean probing depth was 1.56±SD0.43, at 3 months 1.34±SD0.35 and at 6 months value was 1.28±SD0.32. When intra group comparison was done with baseline to 3 months and 6 months' time interval and also between 3 months and 6 months, the values were not statistically significant. With P.value of ≥0.05

Probing Depth: Group-B (CTG+CAF)

At baseline the mean probing depth was 1.66±SD0.44, at 3 months 1.04±SD0.31 and at 6 months value was 1.06±SD0.30. When intra group comparison was done with baseline to 3 months and 6 months' time interval values were statistically significant with the P.value ≤0.001. When the values of 3 months and 6 months were compared the values were not statistically significant with P.value of ≥ 0.05

Probing Depth: Group –A&B

The mean probing depth for TEST group and CONTROL group at baseline were 1.56±SD0.43 and 1.66±SD0.44 respectively, which is not statistically significant, with the P.value of ≥ 0.05 **(0.472).** When inter group comparison was done at 3 months' time, the TEST group value was1.34±SD0.35 and CONTROL group was1.04±SD0.31, when this value

were subjected to statistical analysis it was statistically significant with P.value of ≤0.001 (**0.012)**. Similarly at 6 months' time interval between the groups the TEST group value 1.28±SD0.32 and for CONTROL group was 1.06±SD0.30, when this values were subjected to statistical analysis, the P.value was ≤0.05 **(0.045),** which is statistically significant.

RELATIVE CLINICAL ATTACHMENT

Relative Clinical attachment level: Group-A (PRF+CAF)

At baseline the mean relative clinical attachment level was 6.96±SD0.92, and at 3 months 6.36±SD0.86, and at 6 months 6.51±SD0.90. When intra group comparison was done with baseline to 3 months and 6 months' time interval and also between 3 months and 6 months the values were not statistically significant, with the P.value of ≥0.05

Relative Clinical attachment level: Group-B (CTG+CAF)

At baseline the mean relative clinical attachment level was 7.23±SD0.68 and at 3months 5.43±SD0.41 and at6 months 5.51±SD0.41. when intra group comparison was done with baseline to 3 months and 6 months' time interval values were statistically significant with the P.value of ≤0.001. When the values of 3 months and 6 months were compared the values were not statistically significant with P.value of ≥ 0.05.

Relative Clinical attachment level: Group –A & B

The mean Relative clinical attachment level for TEST and CONTROL group at baseline were 6.96±SD0.92, 7.23±SD0.68 respectively, at baseline these values were not statistically significant. When inter group comparison was done at 3 months' time, the TEST group value was 6.36±SD0.86 and CONTROL group was5.43±SD0.41, when this value were subjected to statistical analysis it was statistically significant with P. value of ≤0.001 (**0.00)**. Similarly at 6 months' time interval between the groups the TEST group value 6.51±SD0.90 and for CONTROL group was 5.51±SD0.41, when subjected to statistical analysis, the P. value was ≤0.001 **(0.00),** which is statistically significant.

RECESSION DEPTH

Recession Depth: Group-A (PRF+CAF)

At baseline the mean recession depth was 5.43±SD0.64, at 3 months 5.01±SD0.82 and at 6 months was 5.12±SD0.56. When intra group comparison was done with baseline to 3 months and 6 months' time interval and also between 3 months and 6 months the values were not statistically significant, with the P. value of ≥0.05

Recession Depth: Group-B (CTG+CAF)

At baseline the mean recession depth was 5.66±SD0.55, at 3 months 4.45±SD0.48 and at 6 months was 4.47±SD0.51. When intra group

comparison was done with baseline to 3 months and 6 months' time interval values were statistically significant with the P. value of ≤0.001. When the values of 3 months and 6 months were compared the values were not statistically significant with P. value of ≥ 0.05.

Recession Depth: Group A &B

The mean Recession depth for TEST group and CONTROL group at baseline were 5.43±SD0.64 and 5.66±SD0.55 respectively, at baseline values were not statistically significant**.** When inter group comparison was done at 3 months' time, the TEST group value was 5.01±SD0.82 and CONTROL group was 4.45±SD0.48, when this value were subjected to statistical analysis it was statistically significant with P. value of ≤0.05 (**0.024)**. Similarly at 6 months' time interval between the groups the TEST group value 5.12±SD0.56 and CONTROL group was 4.40±SD0.51, when subjected to statistical analysis, it was statistically significant with the P. value was ≤0.05 **(0.002).**

KERATINISED GINGIVA

Keratinized Gingiva: Group-A (PRF+CAF)

At baseline the mean width of keratinised gingiva was 3.10±SD0.71, at 3 months 2.61±SD0.91 and at 6 months 2.93±SD0.87. When intra group comparison was done with baseline to 3 months and 6 months' time interval and also between 3 months and 6 months the values were not statistically significant, with the P.value of ≥0.05

Keratinised Gingiva: Group-B (CTG+CAF)

At baseline the mean width of keratinised gingiva was 3.40±SD0.77, at 3 months 3.06±SD0.60 and at 6 months 3.31±SD0.77. When intra group comparison was done with baseline to 3 months and 6 months' time interval and also between 3 months and 6 months the values were not statistically significant, with the P. value of ≥0.05

Keratinised Gingiva: Group A&B

The mean width of keratinised gingiva for TEST group and CONTROL group at baseline were 3.10±SD0.71and 3.40±SD0.77, which is not statistically significant**.** When inter group comparison was done at 3 months' time, the TEST group value was 2.61±SD0.91 and CONTROL group was 3.06±SD0.60, when this value were subjected to statistical analysis it was not statistically significant with P. value of ≥0.05 (**0.104)**. Similarly at 6 months' time interval between the groups the TEST group value 2.93±SD0.87 and for CONTROL group was 3.31±SD0.77, which was not statistically significant with , the P. value was ≥0.05 **(0.208).**

GINGIVAL PHENOTYPE

Gingival Phenotype: Group-A (PRF+CAF)

At baseline the mean thickness of gingiva was 0.70±SD0.29, at 3 months 1.15±SD0.35 and at 6 months 1.28±SD0.40. when intra group comparison was done with baseline to 3 months and 6 months' time interval

values were statistically significant with the P.value of ≤0.001. When the values of 3 months and 6 months were compared the values were not statistically significant with P.value of ≥ 0.05.

Phenotype: Group-B (CTG+CAF)

At baseline the mean gingival thickness was 0.72±SD0.30, at 3 months 1.46±SD0.38 and at 6 months 1.62±SD0.42. when intra group comparison was done with baseline to 3 months and 6 months' time interval values were statistically significant with the P.value of ≤0.001. When the values of 3 months and 6 months were compared the values were not statistically significant with P.value of ≥ 0.05.

Phenotype: Group-A & B

The mean Gingival thickness for TEST group and CONTROL group at baseline were 0.70±SD0.29 and 0.72±SD0.30 respectively, which is not statistically significant**.** When inter group comparison was done at 3 months' time, the TEST group value was1.15±SD0.35 and CONTROL group was1.46±SD0.38, when subjected to statistical analysis it was statistically significant with P.value of ≤0.05 (**0.023)**. Similarly at 6 months' time interval between the TEST group value 1.28±SD0.40 and for CONTROL group was 1.62±SD0.42, when subjected to statistical analysis, the P.value was ≤0.05 **(0.027),** which is statistically significant.

DISCUSSION

Obtaining predictable and aesthetic root coverage has become an important part periodontal therapy. Since the late 1990, greater understanding of soft tissue biology especially, in oral wound has revealed that several components within the blood can alter and/ or accelerate the wound healing biology. Platelets activation in response to tissue damage and vascular exposure results in the formation of platelet plug, and blood clot, to provide haemostasis. Platelet enriched clots revealed, a dramatic difference in the composition compared to natural clot (95% of platelets).

PRF is a second generation of platelet concentrate which can promote cellular chemotaxis, proliferation, differentiation and lying down of extracellular matrix, by various growth factors.

PRF has been successfully tried in various clinical soft and hard tissue periodontal regenerative surgeries, because of its bio-compatibility and bio-degradable properties. Very few clinical studies have investigated and elaborated the role of platelet rich concentrate (PRF) in soft tissue muco-gingival procedures, the current Gold Standard soft tissue graft for gingival recession is connective tissue graft (CTG).

Although the CTG may be the most predictable technique fort root coverage, several limitations with its use exist. A) Obtaining a CTG requires a remote harvest site, B) limited amounts of donor tissue are available for any

given procedure, and C) an invasive donor site surgery may lead to increased morbidity. To overcome these limitations, therapeutic alternatives with autologous hematopoietic concentrate (PRF) have been investigated.

In the present study when the clinical parameters at baseline, the values for the both groups did not differ statistically significant from each other. Therefore the post-operative difference between and within the groups can be attributed to the clinical effect of the material. In the both groups (TEST & CONTROL) the changes in the clinical parameters were tabulated at baseline and during recall visits at 3 months and 6 months' time intervals individually, and mean of these values were subjected to statistical analysis, the level of significance between the two group were obtained.

The study design included 20 patients seeking treatment for Miller class I multiple recession with a probing depth less than 3 mm, satisfying the inclusion criteria. The surgical protocol implement were identical for both the groups the clinical parameter were assessed and recorded at baseline, 3 months and 6 months. Assessing the clinical efficacy for each material pertaining to root coverage procedure showed both the material were therapeutically effective in improving the clinical parameter for baseline to end of 6 months' time period.

Mean probing depth for 2 groups did not show much reduction in probing value form baseline to the end of 6months period, reason can be attributed to periodic recall and strict oral hygiene regimen and controlled

monitoring of the patient maintenance for adequate plaque control measure in both the groups, the time period accordance to the study however when comparison were made statically for individually connective tissue graft (CTG) group showed a statistical significant reduction compared to platelet rich fibrin (PRF) this could be the attributed to the increase in the bulkiness of gingival phenotype post operatively which might be a more well organised connective tissue framework which can decrease resistance in the probing at follow up recall visit at 3 months and 6 months. When inter group comparison were done there was a decrease in the probing pocket depth between 3 months and 6 months and the values were statistically significant at 1% level .

This is in accordance with **Sofia Aroca et al** [91] where the probing depth reduction in PRF group is mainly due to reduction in clinical attachment level and coronally advancement technique. Similarly there are studies like **Sandro Bittencourt et al** [88] showed using connective tissue graft in recession coverage is effective in reducing probing depth.

In terms of the keratinized gingiva when compared between and within groups it remained stable throughout the study period even though coronal advancement was done initially at the time of surgery. Displaced mucogingival junction would have reverted back to its predetermined position at the follow up visit. The control group is concerned when a connective tissue graft (CTG), placed under a non-keratinized mucosae would have a less chance to convert into native phenotype. PRF because of its limited time

period in the surgical site doesn't have the component to influence the overlying tissue to transform into a stable keratinized tissue. Studies have also substantiated that it term of keratinization of the mucosae doesn't happen with a year time.

Gurgaon et al [38] studied the mucogingival line changes following the coronally advancement flap technique. The position of MGL was moved coronally to as much as 2.31±0.72mm during surgery. And the results showed the MGL moved apically 1.3mm in 60 months and the greatest amount of reversion occurred in 1 months after surgery.

Wennstrom and Zuchelli et al [101] in their study in treating Miller's class I gingival recession using connective tissue graft the mean keratinised gingiva moved coronally 4mm on an average, which was displaced 2.9mm apically after 2 years, thus showed 72.5% reversion.

In terms of the Recession depth, Relative clinical attachment level and gingival thickness, improvement was seen between baseline to 6 month examination. Within and between groups over a time period, CONTROL group showed a significant gain in the clinical attachment level (i.e) 70% which was statistical significance whereas TEST group was not significant statistically. When intergroup comparison was done there was a gain in the relative clinical attachment (i.e) 48% between the 3rd and 6th month, reason can be there due to periodic recall and proper plaque control measure reduction decrease in the depth of the recession by the surgical procedure and also decrease in the mean probing depth contributed to the gain in relative

clinical attachment level at 3 months and 6 months' time interval. This was in accordance to previous studies.

Sofia Aroca, **Tibor Keglevich et al** [91], in their studies comparing coronally advanced flap alone or in combination with PRF membrane, at the end of 6 month study period there was statistically significant differences between CAF alone and CAF+PRF, towards coronally advanced flap alone, they reasoned out that the interposition of PRF may restrict the collateral circulation which is essential for thin flap to revascularize and heal, **Hwang D et al.** [51]

More studies and systamtic reviews **Chambrone L et al** [19] are supporting that Connective tissue graft is superior in root coverage procedures than any other material, CTG is superior in reducing the recession width by **O'Leary TJ et al,** [78] **Aichelmann-Reidy et al** [4] etc.

Marginal tissue thickness is the most suitable predicator for the future gingival recession. Even though both the groups showed an acceptable and a stable favourable clinical outcome, at the end of study, CONTROL group showed similar favourable and statistical significant clinical outcomes compared to the TEST group. It has been proven from scientific literatures that, connective tissue graft can enhance the phenotype of the soft tissue.

Present study was in accordance with the previous studies in literature. As far as the TEST group is concerned even though the thickness of the PRF would not be similar to that of the connective tissue graft this autologous source enriched in growth factor have contributed a conducive environment

for the transformation of the gingiva phenotype similar to that of the control site.

Similar results in gingival phenotype were shown by **Sofia Aroca et al[91]** in their earlier studies, the gingival phenotype in recession coverage is increased which was statistically significant at 6 month period, but there is no any systematic review to support the results, **Hwang D, Wang HL et al[51]** showed even a thick flap will increase in thickness after root coverage.

Hence from the result of the present study it can be hypothesized that this material can be a viable alternative source in clinical situations, where native phenotype of the tissue is thin and where it could deemed for harvesting a palatal graft, for the recipient site periodontal plastic surgery. In present study as recession depth is concerned the CONTROL group is able to achieve a predictable root coverage using a bilaminar technique and the clinical improvement was elicited from baseline at 3 and 6 months, values were statistical significance within and between the groups. When TEST group were considered for predictability of root coverage PRF was not able to achieve better root coverage, this may be because of non-bio-availability of the material at the recipient site till the initial maturation of graft **Hwang D et al,[51]** even though the autologous source is enriched with growth factor due to it short time in surgical site and rapid degradation by the native cell might contribute in better healing, but not in root coverage.

Table 11: GROUP-A INTRA GROUP COMPARSION OF MEAN CLINICAL PARAMETRIC VALUES AT DIFFERENT TIME INTERVAL

PARAMETERS	TIME PERIOD	MEAN ± SD	P VALUE/B-6months	SIGNIFICANCE
PROBING DEPTH (mm)	BASELINE	1.56+0.43		
	3 MONTHS	1.34+0.35	0.053	≥0.05/NS
	6 MONTHS	1.28+0.32		
Relative CAL (mm)	BASELINE	6.96+0.92		
	3 MONTHS	6.36+0.86	0.116	≥0.05/NS
	6 MONTHS	6.51+0.90		
RECESSION (mm)	BASELINE	5.43+0.64		
	3 MONTHS	5.01+0.82	0.165	≥0.05/NS
	6 MONTHS	5.12+0.56		
KERATINISED GINGIVA (mm)	BASELINE	3.10+0.71		
	3 MONTHS	2.61+0.91	0.518	≥0.05NS
	6 MONTHS	2.93+0.87		
GINGIVAL PHENOTYPE (mm)	BASELINE	0.70+0.29		
	3 MONTHS	1.15+0.35	0.00	≤0.001/HS
	6 MONTHS	1.28+0.40		

P.value: Between baseline 3 months and 6 months' time is ≥ 0.05 denotes, not statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.05 denotes statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.01 denotes statistically significant at 1% level

P.value: Between baseline 3 months and 6 months' time is ≤0.001 denotes statistically significant at **Less** than 1% level.

Table 12: GROUP-B INTRA GROUP COMPARSION OF MEAN CLINICAL PARAMETRIC VALUES AT DIFFERENT TIME INTERVALS

PARAMETERS	TIME PERIOD	MEAN ± SD	P VALUE/B-6Months	SIGNIFICANCE
PROBING DEPTH(mm)	BASELINE	1.66+0.44		
	3 MONTHS	1.04+0.31	0.00	≤0.001/HS
	6 MONTHS	1.06+0.30		
RelativeCAL (mm)	BASELINE	7.23+0.68		
	3 MONTHS	5.43+0.41	0.00	≤0.001HS
	6 MONTHS	5.51+0.41		
RECESSION (mm)	BASELINE	5.66+0.55		
	3 MONTHS	4.45+0.48	0.00	≤0.001HS
	6 MONTHS	4.47+0.51		
KERATINISED GINGIVA (mm)	BASELINE	3.40+0.77		
	3 MONTHS	3.06+0.60	0.468	≥0.05/NS
	6 MONTHS	3.31+0.77		
GINGIVAL PHENOTYPE (mm)	BASELINE	0.72+0.30		
	3 MONTHS	1.46+0.38	0.00	≤0.001/HS
	6 MONTHS	1.62+0.42		

P.value: Between baseline 3 months and 6 months' time is ≥ 0.05 denotes, not statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.05 denotes statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.01 denotes statistically significant at 1% level

P.value: Between baseline 3 months and 6 months' time is ≤0.001 denotes statistically significant at **Less** than 1% level

SUMMARY AND CONCLUSION

According to the 1996 **W**orld **W**orkshop in **Periodontics**, gingival augmentation may be indicated (a) in conjunction with tooth movement when a dehiscence develops; (b) to halt progressive recession for **aesthetic reasons**; (c) to facilitate plaque control and/or patient comfort; and (d) in conjunction with fixed or removable prosthetics.

In the last decade, aesthetics has become a major concern in periodontal therapy. Gingival recession resulting in the denuded root surface and the loss of the gingival papillae are the two main concerns in periodontal aesthetics. Present study is to compare clinical efficiency of Platelet rich fibrin (PRF) with that of Connective tissue graft by using Bilaminar technique among randomly selected 20 patients between age 18-40 years, under inclusion and exclusion criteria.

The parameters used to evaluate the results are, recession depth, probing depth, clinical attachment level, width of attached gingiva and phenotype at baseline, 3 months and 6 months.

Within the framework of this study, the following conclusions have been elucidated:-

1. The mean probing depth was reduced from baseline, at 3 and 6 months for both the groups, but between group A (TEST), it is not statistically significant whereas in group B (CONTROL) it is statistically significant.
2. Though the mean recession depth reduces in both groups, it is statistically significant in group B, (CONTROL)
3. Similarly clinical attachment gain is significant only in group-B (CONTROL)
4. The mean width of keratinised gingiva though reduced at 3 months in both the groups, it slowly reverted back to baseline at 6 months.
5. The gingival biotype showed marked difference between baseline and 3, 6 months in both the groups, and is statistically significant.
6. Within the group B (CONTROL), there exists less difference between 3 and 6 months, in all parameters.

Thus the results clearly indicate Connective tissue graft remains "***Gold standard***", in recession coverage, in spite of certain limitations. The PRF though it increases gingival biotype significantly its use in recession management is to be further evaluated with studies involving larger sample size and longer follow-up period.

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Table 15: GROUP –B (CTG+CAF) INTRA GROUP COMPARISON OF MEAN PROBING DEPTH AT DIFFERENT TIME INTERVALS

Probing Depth (mm)	BaselineVs 3 months (B-3Mts)	BaselineVs 6 months (B-6Mts)	3monthsVs 6 months (3-6Mts)
P.Value	0.00	0.00	0.987
Significance	≤0.001/HS	≤0.001HS	≥0.05/NS

TABLE 16: INTRA GROUP COMPARISON OF MEAN RELATIVE CLINICAL ATTACHMENT LEVEL AT DIFFERENT TIME INTERVALS

RelativeCAL (mm)	BaselineVs 3 months (B-3Mts)	BaselineVs 6 months (B-6Mts)	3monthsVs 6 months (3-6Mts)
P.Value	0.00	0.00	0.902
Significance	≤0.001/HS	≤0.001HS	≥0.05/NS

P.value: Between baseline 3 months and 6 months' time is ≥ 0.05 denotes, not statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.05 denotes statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.01 denotes statistically significant at 1% level

P.value: Between baseline 3 months and 6 months' time is ≤0.001 denotes statistically significant at **Less** than 1% level.

Table 17: Intra group comparison of mean Recession depth at different time intervals

Recession Depth(mm)	BaselineVs 3 months (B-3Mts)	BaselineVs 6 months (B-6Mts)	3 monthsVs 6 months (3-6Mts)
P.Value	0.00	0.00	0.994
Significance	≤0.001HS	≤0.001HS	≥0.05/NS

Table 18: Intra group comparison of mean Gingival Phenotype at different time intervals

Gingival Phenotype(mm)	BaselineVs 3months (B-3Mts)	BaselineVs 6months (B-6Mts)	3monthsVs 6months (3-6Mts)
P.Value	0.00	0.00	0.681
Significance	≤0.001/HS	≤0.001/HS	≥0.05/NS

P.value: Between baseline 3 months and 6 months' time is ≥ 0.05 denotes, not statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.05 denotes statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.01 denotes statistically significant at 1% level

P.value: Between baseline 3 months and 6 months' time is ≤0.001 denotes statistically significant at **Less** than 1% level

Table 14: GROUP-A (PRF+CAF) INTRA-GROUP COMPARISON OF MEAN GINGIVAL PHENOTYPE AT DIFFERENT TIME INTERVALS

Gingival phenotype(mm)	Baseline Vs 3months (B-3Mts)	Baseline Vs 6months (B-6Mts)	3months Vs 6months (3-6Mts)
P.Value	0.001	0.00	0.742
Significance	$\leq$0.01/S	$\leq$0.001/HS	$\geq$0.05/NS

P.value: Between baseline 3 months and 6 months' time is $\geq$ 0.05 denotes, not statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is $\leq$0.05 denotes statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is $\leq$0.01 denotes statistically significant at 1% level

P.value: Between baseline 3 months and 6 months' time is $\leq$0.001 denotes statistically significant at **Less** than 1% level

Table 15: GROUP –B (CTG+CAF) INTRA GROUP COMPARISON OF MEAN PROBING DEPTH AT DIFFERENT TIME INTERVALS

Probing Depth (mm)	BaselineVs 3 months (B-3Mts)	BaselineVs 6 months (B-6Mts)	3monthsVs 6 months (3-6Mts)
P.Value	0.00	0.00	0.987
Significance	≤0.001/HS	≤0.001HS	≥0.05/NS

Table 16: INTRA GROUP COMPARISON OF MEAN RELATIVE CLINICAL ATTACHMENT LEVEL AT DIFFERENT TIME INTERVALS

RelativeCAL (mm)	BaselineVs 3 months (B-3Mts)	BaselineVs 6 months (B-6Mts)	3monthsVs 6 months (3-6Mts)
P.Value	0.00	0.00	0.902
Significance	≤0.001/HS	≤0.001HS	≥0.05/NS

P.value: Between baseline 3 months and 6 months' time is ≥ 0.05 denotes, not statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.05 denotes statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.01 denotes statistically significant at 1% level

P.value: Between baseline 3 months and 6 months' time is ≤0.001 denotes statistically significant at **Less** than 1% level.

Table 17: Intra group comparison of mean Recession depth at different time intervals

Recession Depth(mm)	BaselineVs 3 months (B-3Mts)	BaselineVs 6 months (B-6Mts)	3 monthsVs 6 months (3-6Mts)
P.Value	0.00	0.00	0.994
Significance	≤0.001HS	≤0.001HS	≥0.05/NS

Table 18: Intra group comparison of mean Gingival Phenotype at different time intervals

Gingival Phenotype(mm)	BaselineVs 3months (B-3Mts)	BaselineVs 6months (B-6Mts)	3monthsVs 6months (3-6Mts)
P.Value	0.00	0.00	0.681
Significance	≤0.001/HS	≤0.001/HS	≥0.05/NS

P.value: Between baseline 3 months and 6 months' time is ≥ 0.05 denotes, not statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.05 denotes statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is ≤0.01 denotes statistically significant at 1% level

P.value: Between baseline 3 months and 6 months' time is ≤0.001 denotes statistically significant at **Less** than 1% level

Table 14: GROUP-A (PRF+CAF) INTRA-GROUP COMPARISON OF MEAN GINGIVAL PHENOTYPE AT DIFFERENT TIME INTERVALS

Gingival phenotype(mm)	Baseline Vs 3months (B-3Mts)	Baseline Vs 6months (B-6Mts)	3months Vs 6months (3-6Mts)
P.Value	0.001	0.00	0.742
Significance	$\leq$0.01/S	$\leq$0.001/HS	$\geq$0.05/NS

P.value: Between baseline 3 months and 6 months' time is $\geq$ 0.05 denotes, not statistically significant at 5% level

P.value: Between baseline 3 months and 6 months' time is $\leq$0.05 denotes statistically significant at 5% level

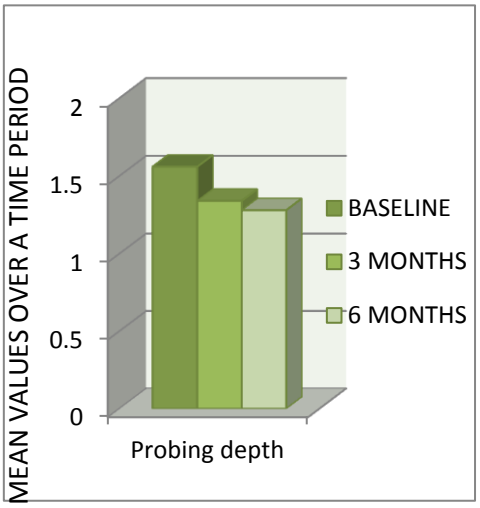
P.value: Between baseline 3 months and 6 months' time is $\leq$0.01 denotes statistically significant at 1% level

P.value: Between baseline 3 months and 6 months' time is $\leq$0.001 denotes statistically significant at **Less** than 1% level

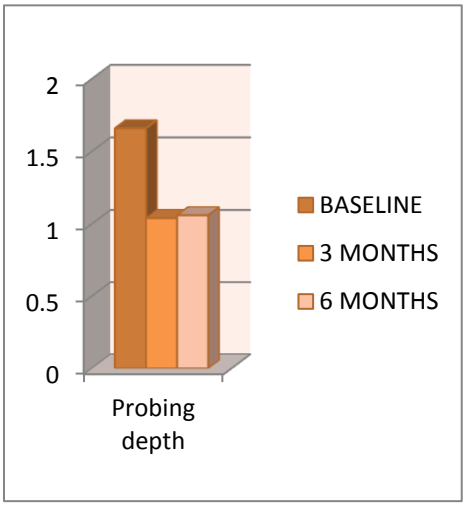
INTER & INTRA GROUP VARIATION IN PROBING DEPTH, CAL, RECESSION DEPTH, KERATINISED GINGIVA, & BIOTYPE IN VARIOUS TIME PERIODS (Mean Value)

Probing Depth

Graph 1: TEST GROUP - A

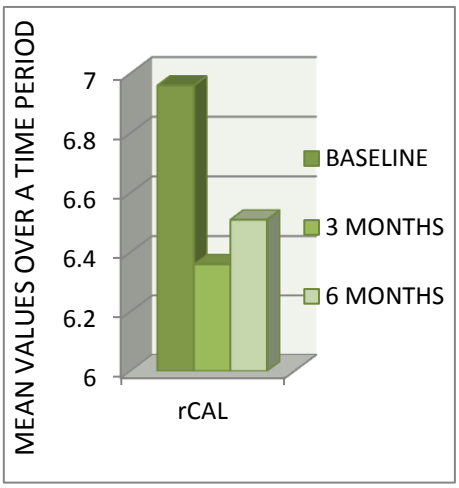


Graph 2: CONTROL GROUP- B

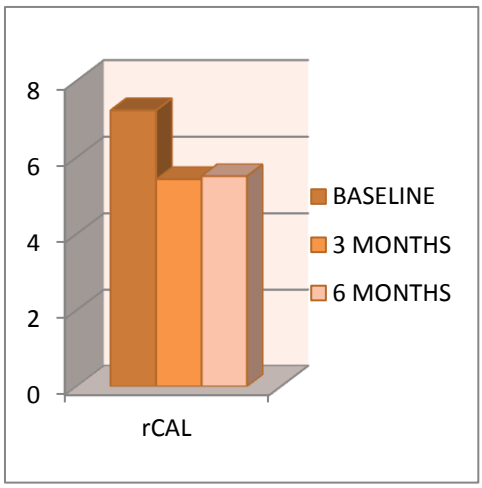


Relative Clinical Attachment Level

Graph 3: TEST GROUP - A

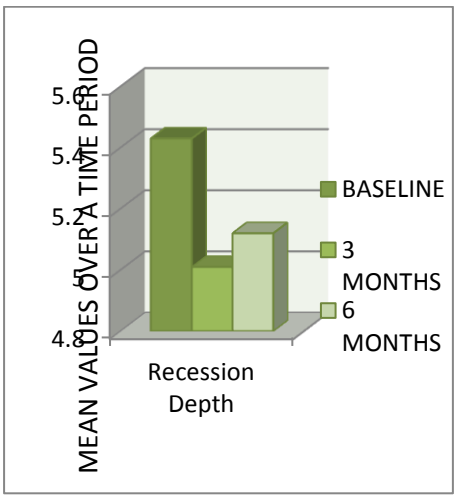


Graph 4: CONTROL GROUP- B

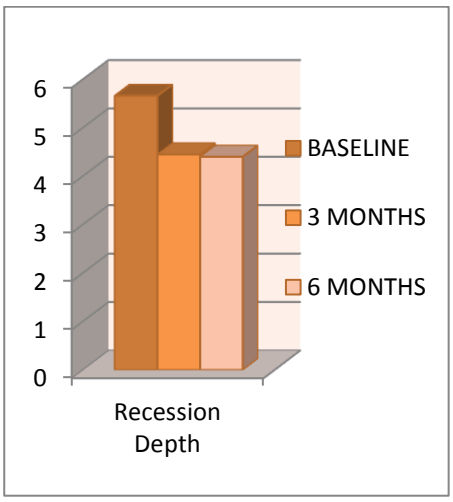


Recession Depth

Graph 5: TEST GROUP - A

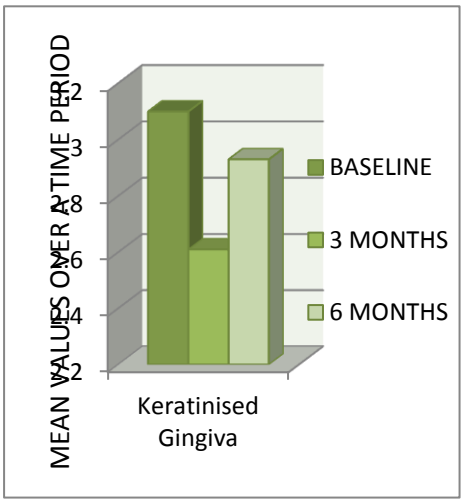


Graph 6: CONTROL GROUP- B

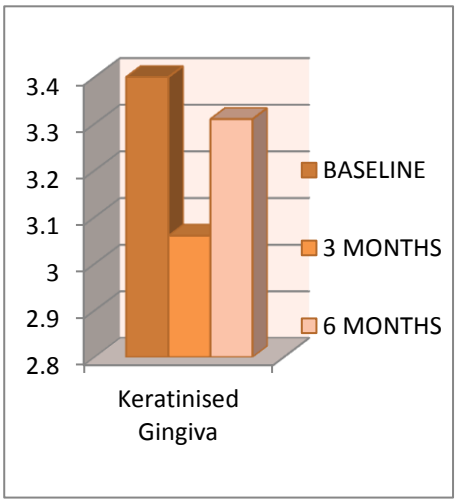


Width of Keratinised Gingiva

Graph 7: TEST GROUP - A

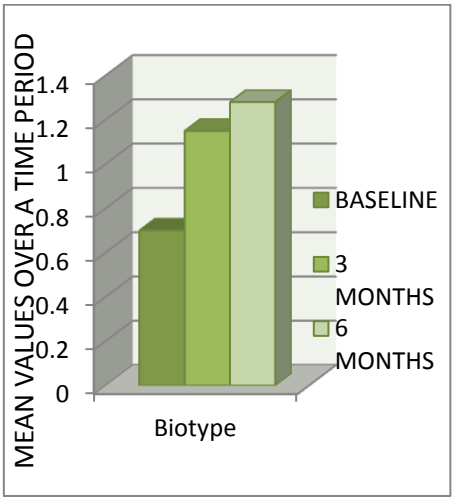


Graph 8: CONTROL GROUP- B

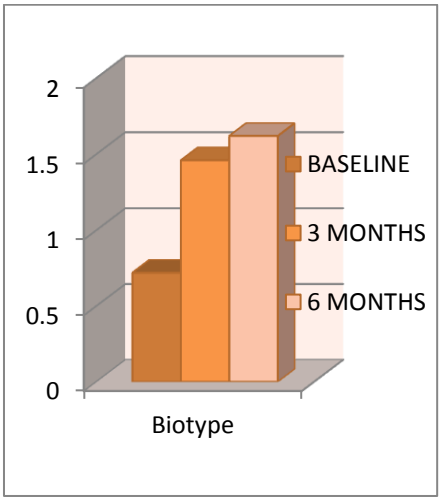


Gingival Biotype

Graph 9: TEST GROUP - A



Graph 10: CONTROL GROUP- B



ARMAMENTARIUM

Fig.1: Instruments & Other Materials

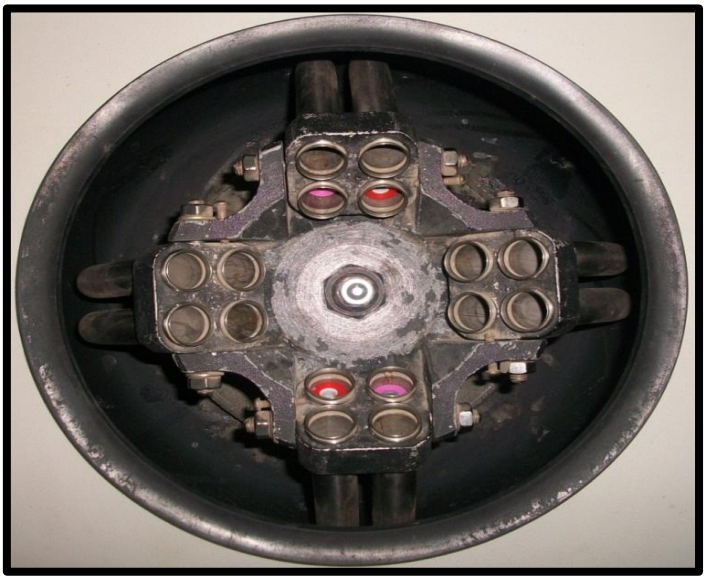


Fig.2 : Centrifuge

Fig.3: CLINICAL PARAMETERS

Fig.3a: Width of Keratinised Gingiva

Fig.3b: Gingiva-Biotype

Fig.3c: Probing Depth

Fig.3d: Recession Depth

GROUP-A (PRF)

Fig.4: Case- 1

Fig.4a: Pre-Operative

Fig.4b: Incision

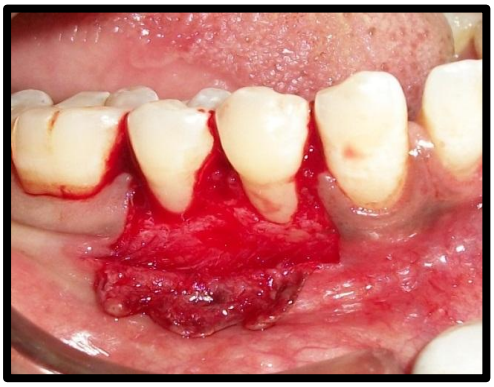


Fig.4c: Flap Elevated

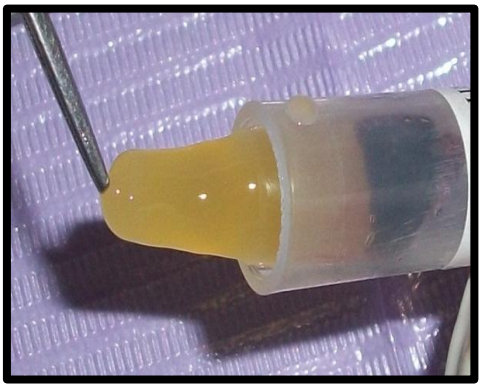


Fig.4d: PRF-Gel

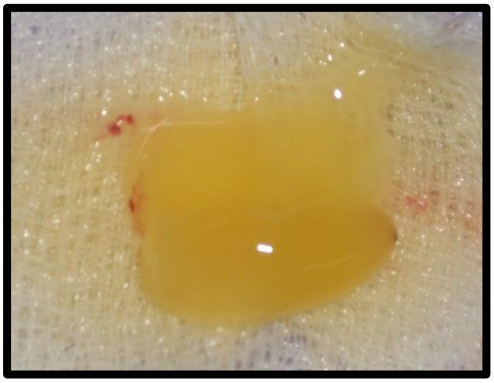


Fig.4e: PRF-Gel on gauze

Fig.4f: PRF-Membrane

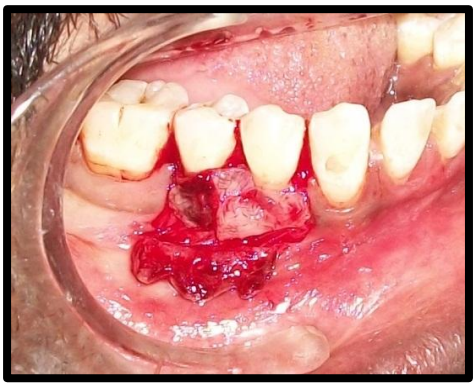


Fig.4g: PRF-Placed on Recipient Site

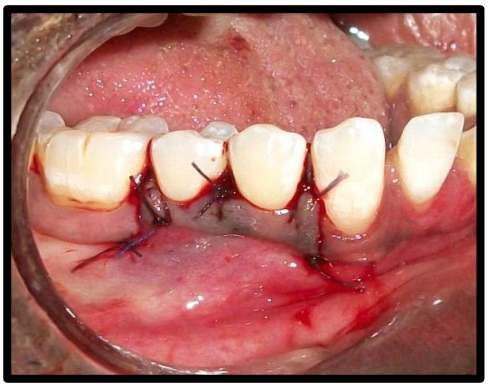


Fig.4h: Sutures Placed

Fig.4i: 3-Months: Post-OP

Fig.4j: 6-Months: Post-OP

Fig.4a:Pre-Operative

Fig.5: Case - 2

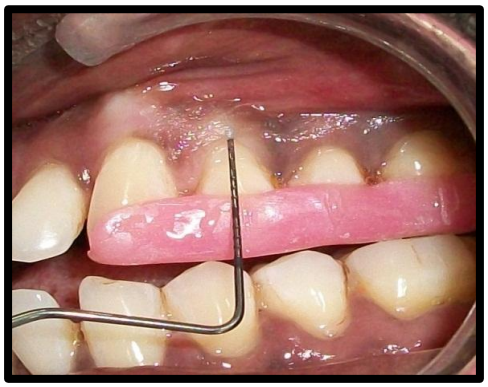


Fig.5a: Pre-Operative

Fig.5b: Surgical Site

Fig.5c:3-Months:Post-Op

Fig.5d: 6-Months:Post-Op

Fig.6: Case- 3

Fig.6a: Pre-Operative

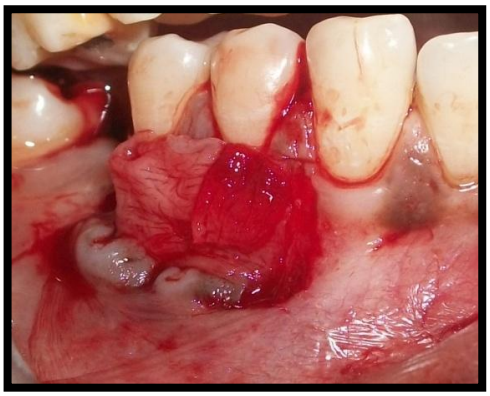
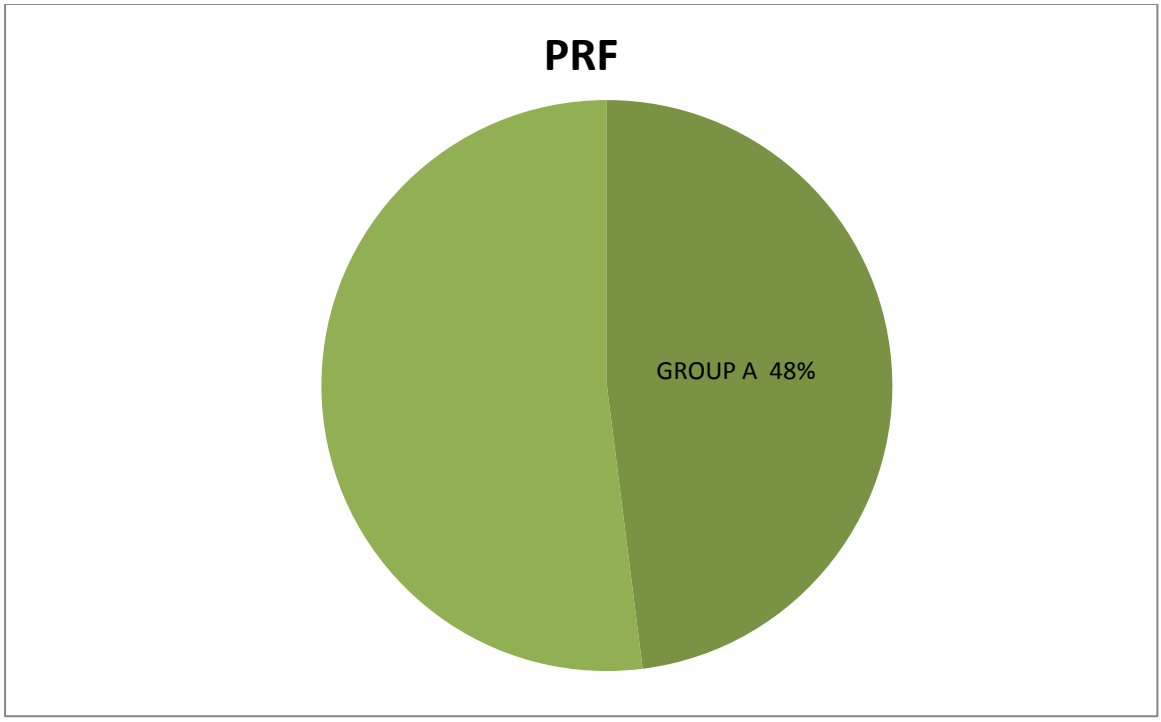


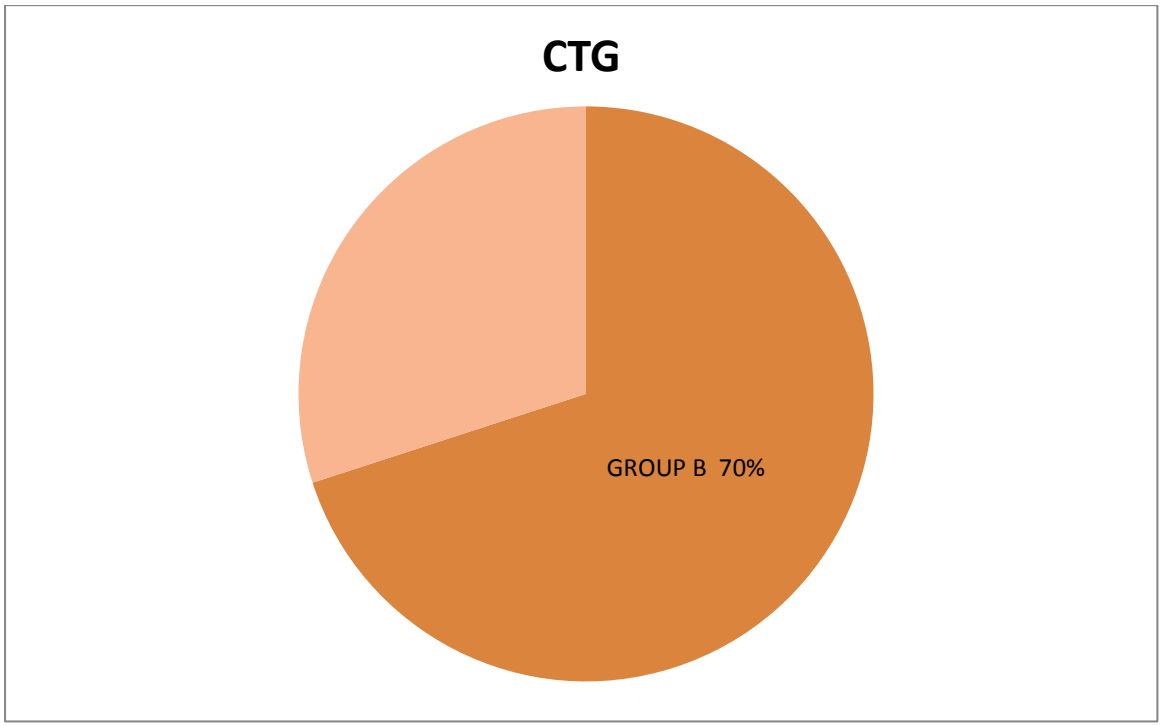
Fig.6b:PRF-in Surgical Site

Fig.6c:3-Months: Post-Op

Fig.6d: 6-Months:Post-Op

MEAN PERCENTAGE OF ROOT COVERAGE OVER A PERIOD OF TIME





GROUP-B (CTG)

Fig.7: Case- 1

Fig.7a:Pre-Operative

Fig.7b: Incision

Fig.7c: Flap Elevated-Recipient

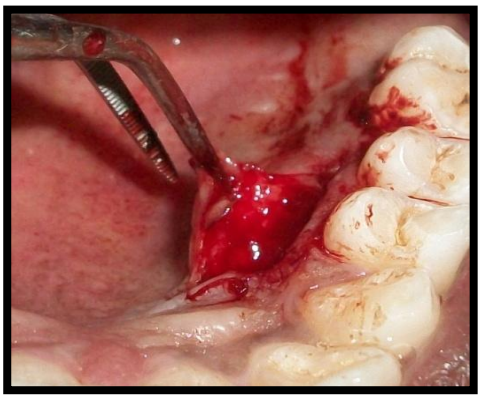


Fig.7d: Flap Elevated-Donor

Fig.7e: Connective Tissue Graft

Fig.7f: Graft Placed on Recipient Bed

Fig.7g: Graft Stabilised

Fig.7h: Sutures Placed

Fig.7i: 1-Month:Post-Op

Fig.7j: 3-Month:Post-Op

Fig.7k: 6-Month: Post-Op

Fig.8: Case- 2

Fig.8a:Pre-Operative

Fig.8b: Surgical Site with CTG

Fig.8c: 1-Month: Post-Op

Fig.8d: 3-Month: Post-Op

Fig.8e: 6-Months:Post-Op

Fig.9: Case- 3

Fig.9a: Pre-Operative

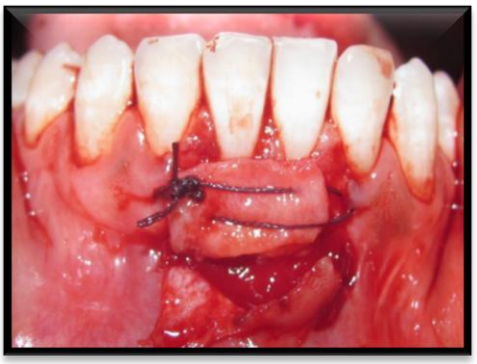


Fig.9b: Surgical site with CTG

Fig.9c:3-Months: Post-Op

Fig.9d:6-Months: Post-Op